



FOREST-WIDE COLLABORATIVE TRAILS ASSESSMENT

CHATTAHOOCHEE-OCONEE NATIONAL FOREST

JANUARY - MAY, 2012
CONTRACT #: AG-435H-S-12-0001




COMPLETED FOR:

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CONTRACT ACTIVITIES

PUBLIC INTERACTION/EDUCATION

A number of different education sessions were presented for Forest Service personnel and interested members of the public as part of the contract. The overarching goal of all the educational sessions was to provide an enhanced base of knowledge for Forest Service personnel and collaborating volunteers to employ in creating a strategic plan to improve the condition of trails across the Chattahoochee-Oconee National Forest. Education sessions included:

- A weekend-long "Trails 101" classroom and field seminar to present modern principles of trail design, construction, and maintenance,
- Three, one-day field seminars (Keown Falls Trail in the Conasauga Ranger District, Green Mountain Trail in the Blue Ridge Ranger District, and the Willis Knob Trail System in the Chattooga River Ranger District) focused on physical assessment process and general findings/ recommendations being developed by the contracting team
- Five, single-day trail design, construction, and maintenance demonstration projects, one in each Ranger District, to provide best practices for implementing the recommendations developed during the physical assessment.

PROJECT KICK-OFF AND INTRODUCTORY EDUCATION

The Chattahoochee-Oconee Collaborative Trail Assessment project was kicked off Friday January 20th, when Trail Dynamics' Woody Keen and Applied Trails Research's Jeremy Wimpey met with USFS personnel at the Forest Supervisor's office in Gainesville, GA. Following the discussion of contracting and project specifics, the team attended the CoTrails Strategic Plan Launch and General Meeting at Unicoi State Park. On Saturday the 21st, Keen and Wimpey conducted formal team and project introductions, followed by a "Trails 101" indoor session. "Trails 101" covered topics of:

- How Trails Develop
- Popular Myths About Trails
- Sciences involved in Trail Planning and Design
- Developing Trail Specifications
- Control Points (positive and negative)
- Guiding Principles for Trail Sustainability
- Fall-Line vs. Rolling Contour Trail
- Predicting User Impacts

Attendees were plentiful and included CoTrails members, trail users, general public, USFS District and Forest Staff. On Sunday the 22nd the "Trails 101" curriculum was further explored outdoors on Unicoi State Park Trails, and the USFS' Anna Ruby Falls developed recreation area and trail system.

ASSESSMENT PROTOCOLS EDUCATION/OUTREACH

Three days of public interaction were held at locations throughout the Forest to explain the assessment process to interested volunteers. Sessions were held on February 11th at the Keown Falls trail (Consauga Ranger District), February 18th on Lower/Upper Green Mountain trails (Blue Ridge Ranger District), and February 25th at the Willis Knob trail system (Chattooga River Ranger District). Topics covered included USFS trail fundamentals, the contracting team's methods for conducting the field inventory, assessment, and classification, and further field-level explanation of many of the Trails 101 course items. Approximately 35 participants attended each session with two or three of the contracting team members leading small groups along the trail, explaining concepts.

EDUCATION/DEMONSTRATION WORKSHOPS

Workshop dates and locations were as follows:

- April 21th: Sustainable high use equestrian trails (Willis Knob Trails, Chattooga River Ranger District
- April 22th: Hands tool use on semi primitive hiking trails (Bartram Trail, Chattooga River Ranger District)
- April 28th: Mountain bike trails: water management and enhancing the user experience (Lower Green Trail, Blue Ridge Ranger District)
- April 29th: Road to Trail Conversions (Bear Creek Trail, Conasauga Ranger District)
- May 5th: Equestrian trail design (Ocmulgee Bluffs Trails, Oconee Ranger District)

All workshops were led by Trail Dynamics staff and participants were a mix of different user types, Georgia Forest Watch volunteers and representatives from local district USFS staff and SO level staff. The purpose of each workshop was to educate participants on specific trail topics and techniques through hands-on learning and also leave behind a small demonstration project illustrating best practices and quality maintenance work on different trail types.

We kicked off the workshops with two consecutive workshops on the Chattooga River Ranger District. Weather for the Willis Knob equestrian trail workshop was wet and rainy so we opted for an indoor presentation at the Ranger District office and split the Sunday workshop time into two halves, with the morning at the Bartram trail (working out of the Warwoman Dell picnic area) and the afternoon out of the trail at Willis Knob. Participation was light but folks were eager to learn both indoors and out. The Bartram trail workshop demonstrated proper location for rolling dips and how to build good drainage structures using only hand tools, including Pulaskis, McLeods, and various types of hoes. Willis

Knob work demonstrated different machines and how to build good drainage structures on wider equestrian trails and employing crushed, compacted stone to harden trail tread surfaces. Several volunteers enjoyed testing out different trail machines with one-on-one instruction.

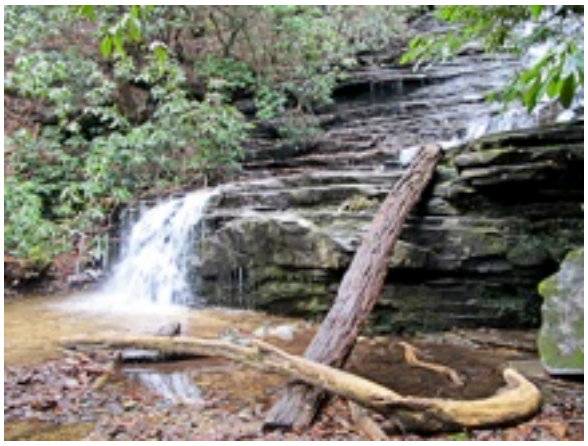
CoTrails volunteer and USFS staff member practice on USFS-owned Ditchwitch 650

The second weekend of workshops was planned for Lower Green Mountain trail and Bear Creek trail, respectively. The Lower Green trail workshop, on the Blue Ridge Ranger District, focused on providing improved drainage on an old forest road being used as a trail managed for mountain biking, enhancing the user experience (making the trail more fun) for mountain bikes while simultaneously reducing potential conflicts through speed management mitigation. Again, participants had the opportunity to work with different trail machines with direct supervision. Tricks of the trade and best practices were shared by three Trail Dynamics staff yielding a high instructor to student ratio. Though the focus was on enhancing the mountain bike trail experience, hikers attending the workshop agreed that the demonstration project provided for a better hiking experience as well. The Sunday workshop took place on different sections of the Bear Creek Trail, with a "walk and talk" on lower Bear Creek looking at advantages for road to trail conversions on both lower Bear Creek and sections of the Pinhoti. Workshop participants then transferred to the Spur section of Upper Bear Creek to observe a road to trail conversion taking place with Trail Dynamics staff running machines and participants performing finish work behind the machines. This workshop likely left the largest visible demonstration project of all the workshops. We completed over 500 feet of road to trail conversion and the before and after comparison was very notable and all participants were impressed with the results and believe that this could be a very valuable tool moving forward.

The final workshop focused again on equestrian trails and took place at the Ocmulgee Bluffs Trail on the Oconee Ranger District. This was the best attended workshop in the series with over 30 in attendance. The focus was different from the workshop on the Chattooga River Ranger District, with an emphasis on planning and design/layout of sustainable trails for horse use. Morning activities included a trail planning exercise and, following an authentic chuckwagon lunch, the focus shifted to trail design with the goal of producing a usable flag line of a proposed contour trail to replace a fall line section of trail dropping off a steep ridge.

PHYSICAL INVENTORY AND ASSESSMENT

The field assessment portion of the project was undertaken in February, 2012. Each mile of the trails designated for assessment was hiked over its entire length at least once during that period. Trail alignment, as well as signage and structure location, collected with Trimble GeoExplorer GPS units (2008 and 6000-series GeoXT or GeoXH). Digital photographs were taken of trailside signage and structures and geo-tagged using Garmin 60-series or Montana gps units.



Each trail was assessed related to modern principles of physical trail setting/sustainability, existing Trail Management Objectives, and USFS trail design parameters, including:

- Trail design and construction quality,
- Trail tread and structure width,
- Tread surface, obstacles, and protrusions,
- Trail grade and relationship to topographic grade,
- Tread cross slope,
- Trail corridor dimensions, and
- Turn radii.

The trails were also assessed on the basis of social sustainability, including:

- Potential for safety-related incidents,
- Potential for user-conflicts,
- Quality of recreation experience for managed uses from the standpoints of a desirable trail tread, length and/or diversity of experiences provided, attaining positive and avoiding negative control points,
- Quality and location of access facilities such as trailheads, maps, and signage.

Each trail was assessed related to modern principles of managerial setting/sustainability, including:

- Management of water from rain and stormwater runoff as well as groundwater interception (i.e. seeps, springs, streams),
- Management of trail corridor conditions, including down and hazard trees and encroaching vegetation,
- Trail tread maintenance condition and susceptibility to recreation-related impacts
- Navigability.

COLLABORATIVE INFORMATION DEVELOPMENT

On-line survey tools were created to gauge Forest Service and public opinion regarding the above aspects of Physical, Social, and Managerial Setting/Sustainability. The survey links were disseminated by the Forest Service internally and by CoTrails to the general public. An additional survey was created and disseminated to groups actively collaborating with the Forest Service and responses were received by Backcountry Horsemen of North Georgia, Georgia Forest Watch, IMBA/SORBA, and the Mountain High Hikers. Finally, Forest Service personnel at each Ranger District were requested to provide information regarding each trail's inclusion in the assessment, as well as each trail's history and maintenance record.

Contracting team members provide instruction to CoTrails volunteers in mini excavator operation while Forest Supervisor George Bain assists a hand construction crew during field demonstrations

DELIVERED PRODUCTS

- A written document includes the physical assessment of each trail and responses from Forest Service and public collaborators are presented for each trail along with prioritized recommendations,
- Spatial data, processed to USFS standards, and delivered to the Forest Service for inclusion in the Forest's Geographic Information System.
- Geotagged digital photo library of trail, sign, and structure conditions at the time of the assessment,
- Revised Trail Management Objectives, in Excel format, that correspond with the recommendations included in the assessment report.

FOREST-WIDE FINDINGS

Recent nationwide directives for the United States Forest Service attempt to encourage a more detailed analysis of:

"the set of recreation settings and opportunities on the National Forest System that is ecologically, economically, and socially sustainable for present and future generations."

"In the assessment phase (§ 219.6), the responsible official must identify and evaluate existing information relevant to recreation settings, opportunities, and access, in addition to recreational infrastructure, benefits people obtain from the plan area and the contribution of multiple uses to the local, regional, and national economies, and take sustainable recreation and scenic character into account when developing plan components to contribute to social and economic sustainability."

The official system of trails within the Chattahoochee-Oconee National Forest, like many around the country, was developed out of convenience, as opposed to the purposeful development based on physical sustainability, recreational quality, or management capacity. This assessment attempts to identify and evaluate existing conditions and make recommendations for improving the physical, social, and economic sustainability of both the trails and the contribution of recreation to the local/regional economies and quality of life. The following section speaks to the entire forest, with general observations that were prevalent throughout our field assessment. Specific assessment and recommendations will follow as they pertain to each trail included in the assessment are included in subsequent chapters organized by ranger district. .

SETTINGS

The Chattahoochee-Oconee trails largely employ historic industrial routes such as old roads, timber haul routes, and railroads, most likely adopted when the public or Forest Service staff discovered that these open corridors led to interesting forest features such as streams, waterfalls, and expansive vistas. While blazing or signing these open corridors for recreational use was expedient and may have met public access demands at the time, little consideration was given to the ongoing resource impacts or maintenance needs associated with recreational use in these corridors. Past maintenance has focused on providing bridged stream crossings, many of which are currently not meeting Forest Service standards for engineering and/or pose hazards. The lack of effective water management on the trail tread has resulted in rough tread, often wet conditions, and possible sedimentation to intermittent and perennial streams. Current maintenance has focused on the development of viewing structures to decrease vegetation trampling and sedimentation at congregation areas. While the viewing structures are quite impressive, the lack of effective maintenance on the remainder of the trail may be resulting in greater resource impacts. Additionally, the wooden structures being developed, most in terminally moist environments, degrade more quickly and require additional inspection than more sustainably routed trails with modern management techniques for tread condition (rolling contour trail, minimal corridor width, reduced water crossings, and hardening with on-site rock) and water control (positive cross slope, earthen rolling grade dips, knicks).

This is the case with almost all the destination trails in the Forest, including waterfall-access trails and many of the trails along high-quality, scenic mountain streams. The lack of effective maintenance, especially in the case of Class 4 trails, has resulted in rough, often wet trail conditions that limits access to visitors that do not have a high capacity or desire for negotiating the degraded trail conditions.

Older (pre-1990's) trails in the Forest that were developed specifically for recreation have many common design characteristics with the trails created out of the convenience of an already open corridor. First, many of these trails were not constructed, but simply blazed and cleared of low-growing vegetation. This lay-of-the-land routing typically resulted in trails running directly from ridge to gap/river, with trails located on the fall line and carrying water/sediment downhill toward water sources. Second, past maintenance has focused on water bar or step construction. The water bars likely never functioned efficiently, and most of the drains are currently full of sediment. Steps are often suffering from scour erosion, furthering sedimentation. Both types of wooden "fixes" are rotting in many places, exposing rebar and creating safety concerns and sedimentation issues. Current maintenance has focused on trail bridge construction. Many of the bridges are well-built, but may not be necessary with improved trail design/routing. Again, the focus on wooden structures requires higher maintenance intervals/inspections than do rolling contour trails with positive cross slope.

These are longer, hiking-only trails that receive relatively low use due to their length, managed uses, and backcountry setting. Future maintenance will require significant relocations to sustainable grades that fall within Forest Service trail design parameters and alignments with fewer structures that require consistent inspection and replacement. Additionally, formal maintenance agreements and standards may be necessary with stewarding organizations due to inefficiencies associated with limited Forest Service staff in accessing these trails.

The addition of somewhat newer trail systems (1990's to the present) and developed recreation facilities seems to have a close connection with timber harvest activities. Industrial corridors were connected with short sections of trail in the vicinity of developed recreation areas or larger trailheads to create multiple opportunities. In these newer systems, the existing corridors that were adopted have more sustainable gradients, but still retain many of the maintenance challenges presented above, including the challenge of water management over an unnecessarily wide trail tread. When maintenance has occurred, it has often been implemented with six to eight foot wide machines and typical forest road management techniques. Subsequently, these routes have retained the feeling of a road rather than undergoing a transformation into a trail.

Unfortunately these trail systems were not designed to meet particular recreation needs. Duration of recreational outing, presumed challenge sought by visitors, desires of trail tread type/corridor width related to modes of trail use, or effective conflict mitigation between different modes of trail use are not implemented successfully. Often the systems do not provide direct connectivity to the campground or picnic area and trail interconnectivity is dependent on utilizing vehicular roads. In total, these trail systems are not providing a high-quality recreation experience.

OPPORTUNITIES

Resolving many of the issues that are present with the physical sustainability of the Chattahoochee-Oconee National Forest trails provides multi-faceted opportunities, including:

- Mitigating natural resource impacts
- Decreasing trail maintenance backlogs
- Reducing future maintenance needs
- Enhancing recreational quality
- Improving accessibility
- Increasing recreational carrying capacity

Strategically taking advantage of these opportunities will concurrently help the Forest meet current and projected future demands for recreation in Georgia's mountain setting.

Figure 1. Forest-wide Allowed Use by Type

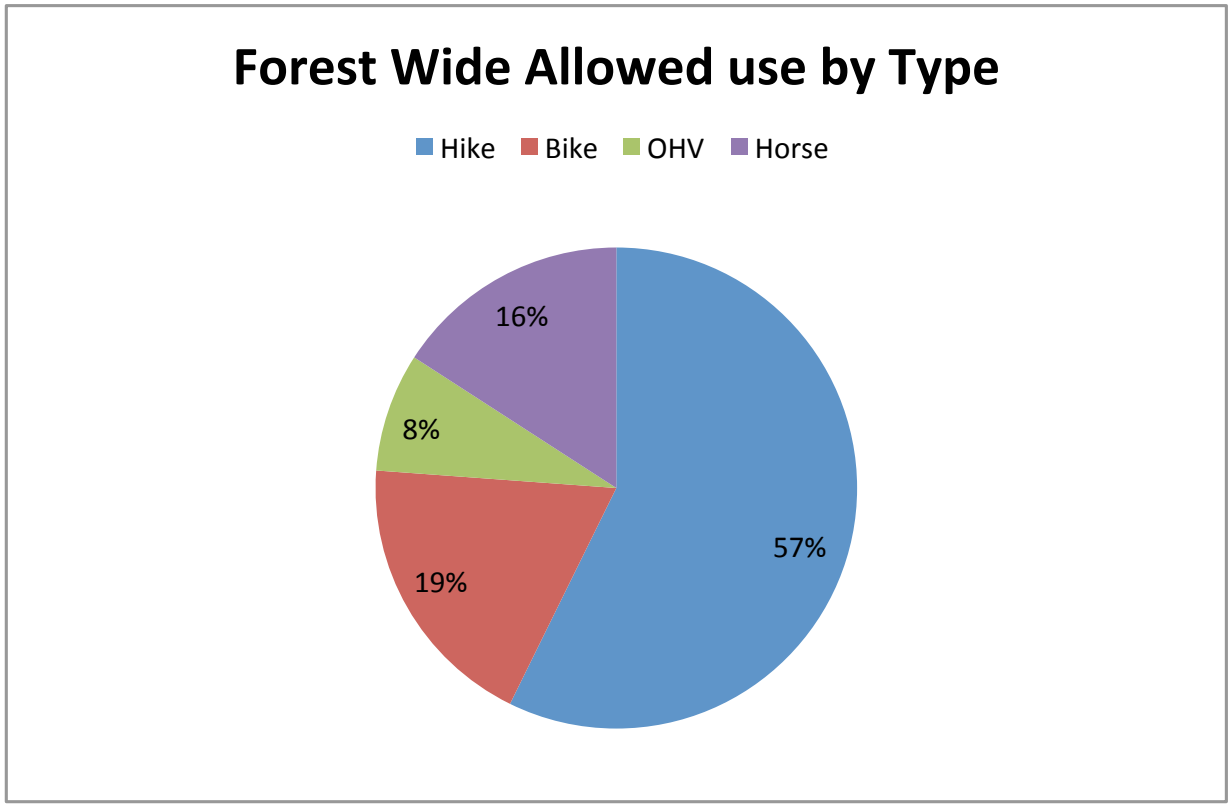


Figure 2. Forest-wide Primary Use by Type and Mileage

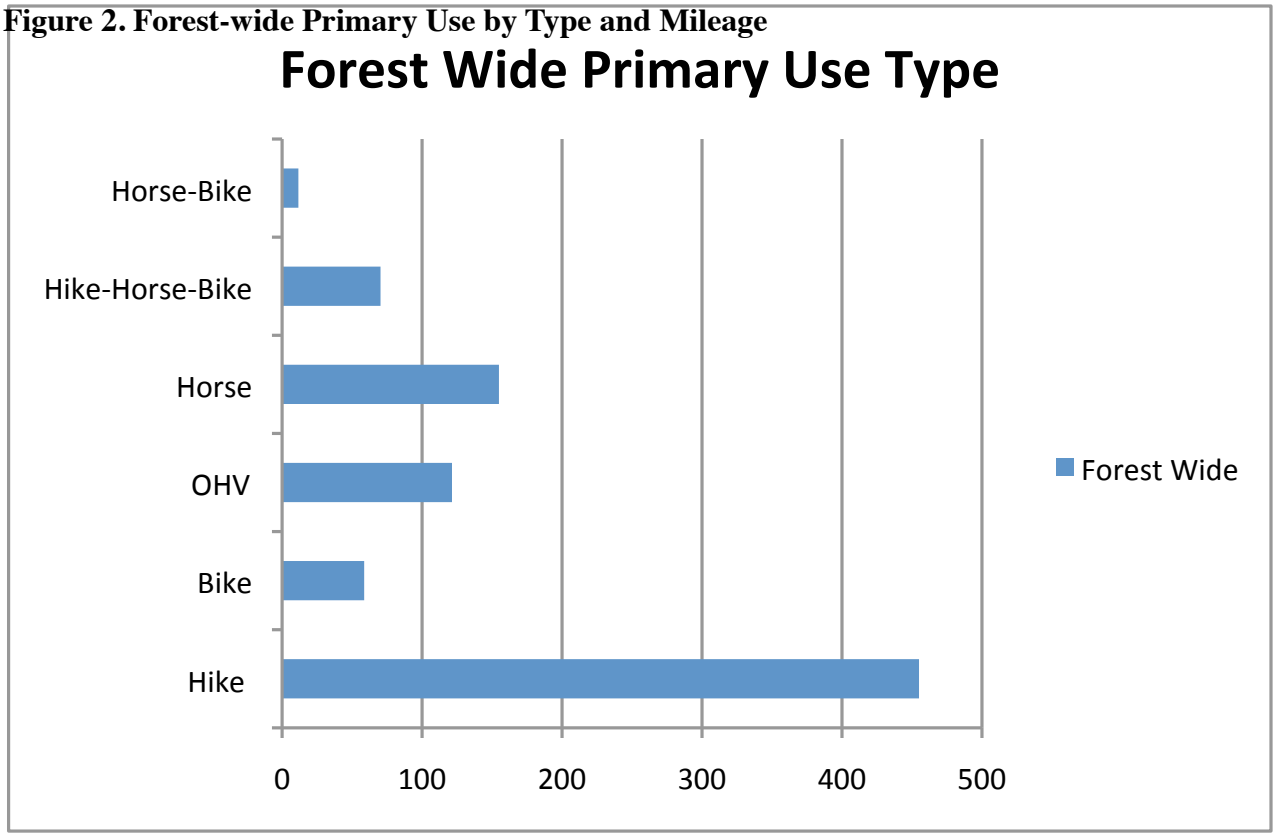
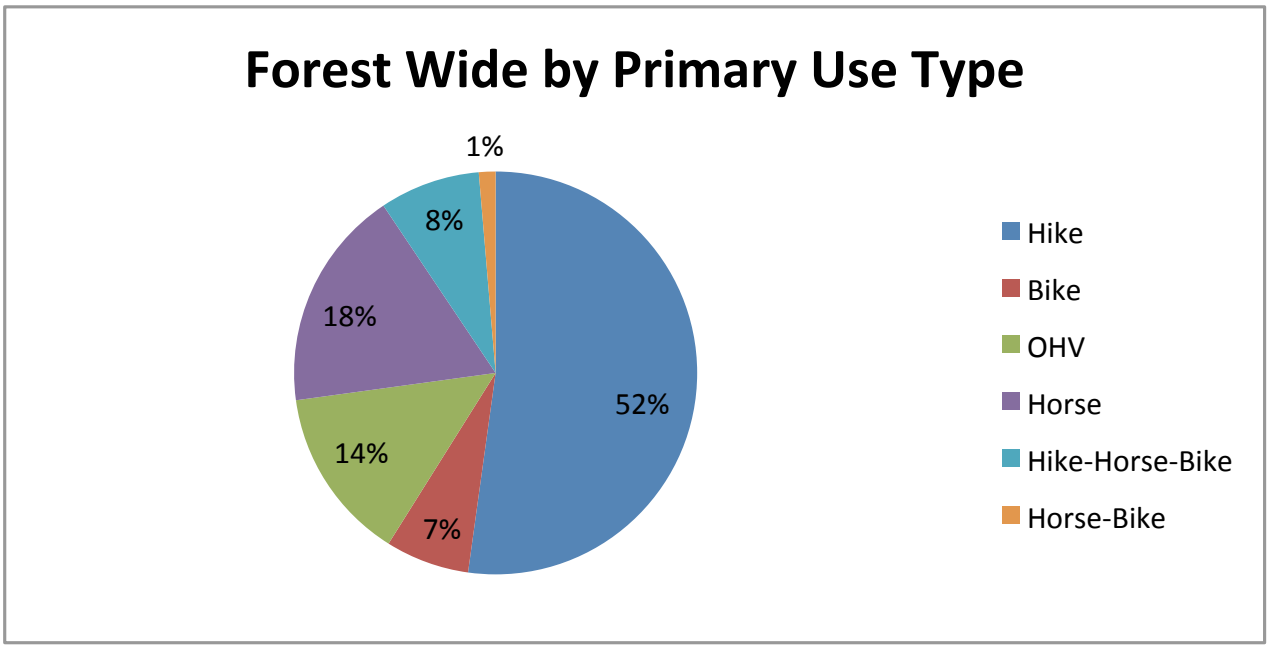


Figure 3. Forest-wide Primary Use by Type and Percentage



ACCESS

Access to the Chattahoochee-Oconee National Forest trails occurs at developed recreation areas, developed trailheads with various levels of visitor facilities, and at signed locations where trails intersect Forest or public roads. The location of developed recreation areas and trailheads were, for the most part, determined two or more decades ago, when recreation demand was not at it current, higher level, and the provided recreation was focused mainly in backcountry settings. Generally, these visitor access nodes, like the Forest's trails, are not in close proximity to towns near the Forest.

When the visitor access nodes were developed, the region's population was smaller (see Tables 1 and 2), and the economy was relatively more dependent on forest products and farming than Forest-based recreation. In the last ten to fifteen years these rural areas have experienced significant second/vacation/retirement home development, especially near the region's many reservoirs. Concurrently, the regional economy has come to focus on tourism and recreation to a much greater extent, serving the growing metro Atlanta population.

As this trend continues, small towns and their visitors could benefit from access improvements to Forest lands and trails. Trailheads and trail systems in closer proximity to towns or major regional highways keep visitors closer to the goods and services which support their outing and reduce the burden on the Forest Service to be the sole provider of sanitation, overnight accommodation, and marketing of recreation opportunities. Management partnerships with towns/counties/organized groups for these nodes/trails is more probable with greater proximity to these collaborative managers. Finally, improved trail infrastructure nearer to the towns and area lakes can begin to disperse use volumes and maintenance needs in many of the more heavily used backcountry locations.

The existing developed recreation areas in the Forest are often not directly connected to nearby trails. With a climate that is conducive to trail-based recreation for nine to ten months each year, it is reasonable to predict that well-developed, diverse trail systems connected to these areas could be operated at capacity much of the year. Bringing trail users, many of whom are not backcountry-savvy enthusiasts, to these areas, including developed trailheads, provides an easy point of contact for Forest Service and volunteer stewards to provide outreach, education, and interpretation of forest resources.

Many of the Forest's older trailheads have relatively low vehicle capacity, typically providing room for two to ten vehicles without trailers, and cannot meet current demands for space. These trailheads also have very few attendant facilities such as sanitation, drinking water, trash receptacles, and lack sufficient kiosk and signage information that many visitors expect and benefit. If these were truly backcountry trailheads that receive relatively low visitation from predominantly experienced trail enthusiasts, the situation may not cause managerial problems as those visitors would be more likely practicioners of leave-no-trace principals. However, littering, vegetation trampling, and social trail formation are quite prevalent in these areas, and it is assumed that biological loading and vandalism are also issues that provide management challenges.

The new trailheads in the Forest are generally larger and have more facilities. However, most have very few trail options from the parking area, leading to more user interactions during peak visitation and less use during off-peak times. These already developed facilities, especially those in close proximity to tourism nodes, are excellent candidates for trail system expansion and diversification.

MOVING FORWARD

It is quite apparent, following the field assessment and collaborative information gathering, that the Chattahoochee-Oconee National Forest system of trails has significant challenges. Whether related to budget availability, prioritization, lack of knowledge, or weak partnerships, the Forest's trails currently have a long list of high-priority needs. Recreation budgets continue to dwindle and staff/volunteers with valuable skills retire, while recreation demand increases.

This would seem to be a very dire situation, if it were not for the CoTrails working group that has been established. In the contracting team's broad experience, a Forest-wide endeavor that is universally supported by so many different interest groups has no precedent in Region 8 of the Forest Service. With this assessment employed as a "state of the trails" report, the group can begin strategic outreach within their component groups to develop more and better volunteers. Just as important, with a strategic plan and implementation strategy, the CoTrails group can reach out to and actively lobby additional benefitting parties, including other unaffiliated groups, counties, municipalities, private business/industry, law makers, and the State of Georgia to engage them in the redevelopment of a sustainable system of trails and recreation infrastructure that reduces resource impacts while improving recreational access and opportunities.

Practically stated, the future of the trails in the Forest lies as much in the hands of the public as it does the Forest Service. This dynamic is likely to develop in many other Forests over the next decade. Budgets, populations, and a relative lack of action have brought the situation to the tipping point in the Chattahoochee-Oconee earlier. That may not be a hindrance but rather an opportunity to develop precedent-setting levels of collaboration and support that should result in huge success.

HOW TO USE THIS DOCUMENT

This report is organized by ranger district. Each district's section begins with an overview the trails on the district included in the assessment,public education/outreach activities, and a narrative description of general conditions (physical, social, and managerial settings) present across the district and trails assessed. Following this introductory discussion, detailed information about each trail assessed is presented using a combination of maps, data, and discussion. This guide will familiarize you with the way we have structured this report and aid in your ability to process its content. Following each district's introductory content, each trail is presented using the following format:

ASSESSMENT FORMS

A. The forms used in the field by our assessment teams. These have been digitally transcribed for legibility.
B. Trail Fundamentals and description are included on the first page along with a locator map.
C. The upper most text box contains basic trail inventory data.
D. Travel Management Strategies: These are the design, managed, and allowed/prohibited uses from USFS TMOs.
E. Design Parameter Recommendations: This section is populated with USFS supplied information from TMOs, and assessment team notes on current and recommended design parameters. The exceptions/comments field contains notes.
F. The second page contains assessment team documentation of the physical, social and managerial settings of the trail assessed.
G. The priorities box contains the teams prioritized recommended actions for the trail assessed.
H. The map at the top of the second page is a conceptual representation of recommended actions. Actions shown on this map (particularly reroutes) will require extensive field based scouting to develop final on the ground designs for implementation.
I. Note that longer trails (i.e. duncan ridge) may have multiple "sets" of field forms describing sections of the trail.
J. Representative Photographs: These photos and captions illustrate typical conditions, problems and features of the trail. Geo-tagged versions of these photos will be included with the final report in electronic format.

TRAIL: PINNACLE

Ranger District	Chattooga River
System Name	Pinnacle
Trail Number	58
Miles Assessed	0.53
Beg. Location	Bartram Trail
End Location	Pinnacle Knob
Trail Class	3- Developed/Improved
Designed Use	Hike

Travel Management Strategies:

Strategy	Hike	Bike	Horse	OHV	Comments
Managed Use	Y	N	N	N	Semi-primitive Motorized

Design Parameter Recommendations:

Design Parameter	USFS DP Value	Rec DP Value	Exceptions/Comments
Tread Width (")	18 (from TMO) 18-36	24-36	Up to 72" currently
Structure Width (")	18 min.	36	
Tread Surface	Native, w/borrow for stabilization	Native, w/borrow for stabilization	Native, eroding
Protrusions/Obstacles (")	<3/12	<3/12	Many from 12-18" currently
Target Grade/Max/Density (%)	3-12/25/10-20	3-12/25/10-20	40+% for more than 30% of length
Target Cross Slope/Max (%)	5-10/15	5-10/15	
Clearing Height/Width (')	8/4 (from TMO) 7-8/3-5	7-8/3-5	Many blowdowns
Turn Radius (')	3-6	3-6	

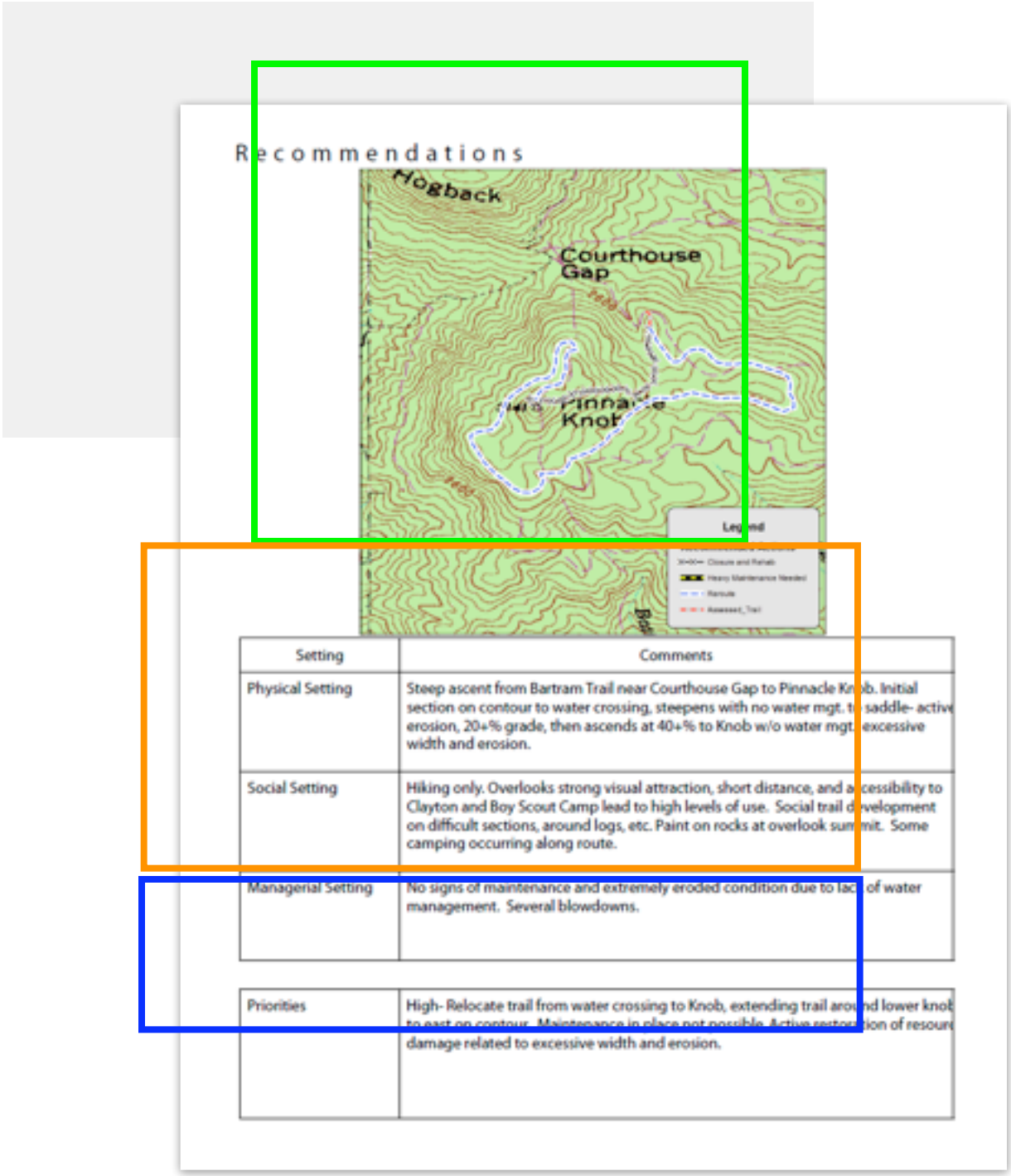
Green Box: Basic trail information from GIS and USFS supplied TMOs.

Orange Box: Current TMO design parameters (upper line) and/or current conditions (lower line).

Blue Box: Recommended design parameters developed by our team.

Red Box: Notes and exceptions to current TMO design parameters.

Purple Box: A locator map showing the trail and its proximity to area roads/trails.



Recommendations

Setting	Comments
Physical Setting	Steep ascent from Bartram Trail near Courthouse Gap to Pinnacle Knob. Initial section on contour to water crossing, steepens with no water mgt. to saddle- active erosion, 20+% grade, then ascends at 40+% to Knob w/o water mgt. excessive width and erosion.
Social Setting	Hiking only. Overlooks strong visual attraction, short distance, and accessibility to Clayton and Boy Scout Camp lead to high levels of use. Social trail development on difficult sections, around logs, etc. Paint on rocks at overlook summit. Some camping occurring along route.
Managerial Setting	No signs of maintenance and extremely eroded condition due to lack of water management. Several blowdowns.

Priorities	High- Relocate trail from water crossing to Knob, extending trail around lower knob to east on contour. Maintenance in place not possible. Active restoration of resource damage related to excessive width and erosion.

Green Box: A map of recommended actions, see legend for symbology.

Orange Box: Description and notes pertaining to the as assessed physical, social and managerial settings of the

Blue Box: Prioritized recommended actions for the trail segment assessed

SURVEY RESULTS

Following the Field Assessment Forms, an appendix contains trail-by-trail results of the public and Forest Service outreach conducted during the contract. The contracting team provided the following opportunities to provide constructive feedback on the trails included in the assessment:

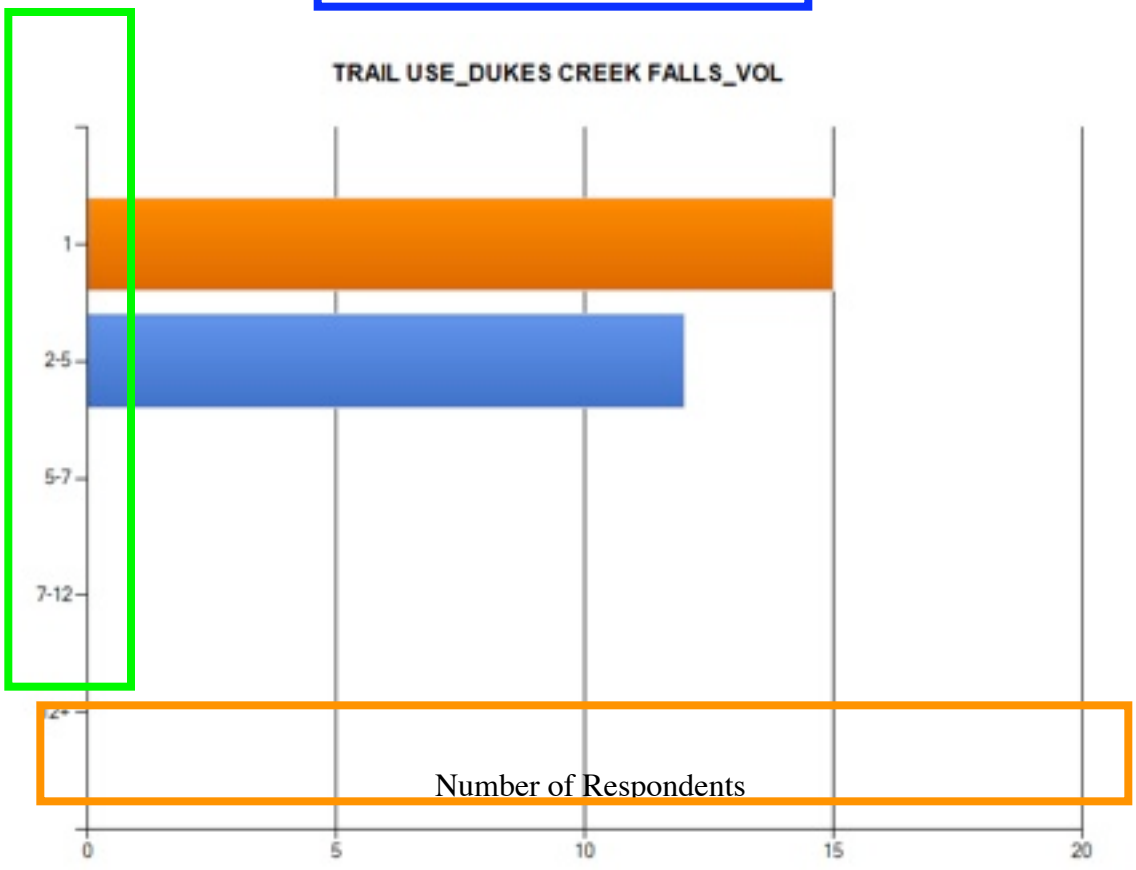
- Forest Service District Level Feedback- Each district was provided with a table listing all trails included in the assessment along with a list of background questions, including "history of the trail", "maintenance operations, history, and partnerships", and "reasons the trail was included in the assessment." The information provided by Forest Service staff has not been edited to preserve the integrity of the response. Specific mention of personnel or volunteers responsible for actions (i.e. design, construction, etc.) have been omitted at the request of the Forest Service.

- On-line Individual Survey: A survey was created in an on-line format and the web address was distributed through the Forest Service and by CoTrails to solicit feedback on individual familiarity with each trail and subjective feelings regarding the trail's physical, social, and managerial setting/ sustainability. The survey had 326 respondents over the course of approximately 45 days. Results were compiled, filtered by Forest Service and Public samples, and the results are presented in graphical format. Sample text is included in Appendix C along with general survey interpretation guidance.

- On-line Group Survey: An additional survey was created in an on-line format and the web address was distributed by the contracting team to prominent volunteer groups assisting in the CoTrails process. Information requested from the groups included: 1) history of trail,if known, and approximate date it became an official part of the Forest Service System of trails, 2) major alterations, change in management, or other significant issues/events, 3) current or past maintenance providers, general maintenance intervals and activities undertaken by each group, 4) an estimate of hours/year expended

on each trail's maintenance by the group, 5) types, amounts, and seasonality of use the trail receives, and 6) known problematic or recurring issues (natural resource and/or visitor management concerns/ problems).

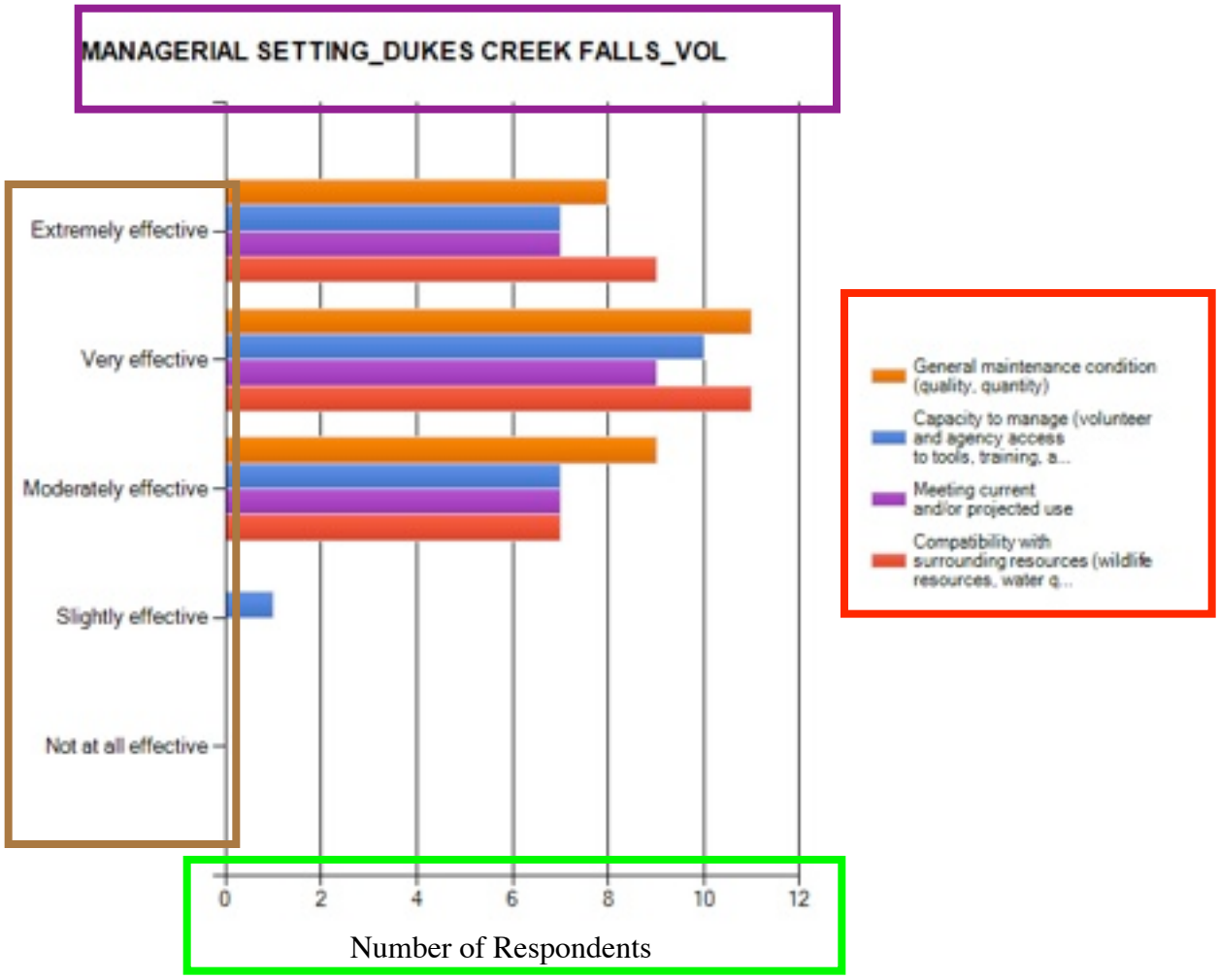
Feedback and survey results were compiled and are presented in text and graphical formats, separated by Forest Service and Public/Volunteer respondents.



Blue Box: Survey Question Title and Respondent Group

Green Box: Number of times the respondent had been on the particular trail in the last two years

Orange Box: Number of Respondents for the question



Purple Box- Title of survey response compilation, trail, and delineation of response from either Forest Service (_USFS) or Volunteers (_VOL)

Brown Box- Subjective opinion regarding the setting/sustainability of the trail in relation to the questions at right (excerpted in red box and fully presented in Appendix C)

Red Box- Survey question excerpts under the heading of "Managerial Setting/Sustainability" section. These are presented in full form in Appendix C

Green Box- Number of Respondents for each question presented in the "Managerial Setting/Sustainability"

Appendix A: Chattahoochee-Oconee National Forest Land and Resource Management Plan, Recreation Direction (Excerpts)

Chattahoochee-Oconee National Forest Land and Resource Management Plan Revision (RLRMP), January 2004 (Excerpts selected based on pertinence to project activities)

Chapter 2- Forestwide Direction
Recreation Opportunities/Experiences

Developed Recreation Areas in close proximity to trails included in the assessment:

- DeSoto Falls
- Keown Falls
- Panther Creek
- Lake Russell
- Cooper Creek
- Warwoman Dell
- Dukes Creek Falls
- Willis Knob Horse Camp

Goal 31: Provide a spectrum of high quality, nature-based recreation settings and opportunities, that reflect the unique or exceptional resources of the Forest and the interests of the recreating public on an environmentally sustainable, financially sound, and operationally effective basis. Adapt management of recreation facilities and opportunities as needed to shift limited resources to those opportunities.

> *Obj. 31.1:* Recognize and respond to emerging recreation trends and uses within the Forest recration niche by periodic assessments.

Goal 32: Provide for the physical security of the forest visitor commensurate with the recreation setting.

> *Obj. 32.1:* Annually identify hazardous trees and plan for removal or mitigation within developed recreation facilities.
>
> *Obj. 32.2:* Develop and keep current cooperative agreemtns with local emergency services for law enforcement, search, rescue, and recovery operations through periodic review.
>
> *Obj. 32.3:* Provide wildlife-proof trash receptacles in concentrated recreation areas within five years of Plan implementation

Goal 33: For Regional Forester Scenic Areas, enhance, restore, and create forest habitats as required for wildlife, rare plant communities, and historic forest types.

Goal 34: Trails do not adversely affect soil and water resources.

Obj. 34.1: Prioritize OHV, horse and pac stock, bike, and hiking trails for condition survey based on their risk of causing adverse effects, conduct surveys, prioritize for remedial action those that are found to be adversely affecting soil and water resources, and correct those situations within five years of Plan implementation.

Obj. 34.2: For trails under Forest Service jurisdiction, bi-annually maintain to established standards:

- 100% of designated OHV trails
- 50% of trails open to horses
- 50% of trails open to mountain bikes
- 33% of foot trails

Standards

Recreation- General

FW-115: Recreational facilities improvements, expansions, and additions will be within the capabilities of the land and appropriate ROS class.

FW-116: Where recreational uses are negatively affecting Federally listed species, or individuals of other species that are neede to maintain their population viability on the national forest, uses and/or sites are modified to eliminate negative effects. Recreational uses may be prohibited if the uses are affecting T&E negatively.

FW-117: All recreation site plans and revisions require Forest Supervisor approval.

FW-118: Recreational Opportunity Spectrum maps will govern all new projects. Existing conditions may not meet the assigned ROS classes.

FW-119: Control insect and disease infestations when detected in recreation areas to provide for public safety and to minimize resource damage to the recreation area.

FW-120: Recreation uses and resource conditions within riparian corridors will comply with the riparian corridor management prescription.

FW-121: Promptly implement mitigation measures for recreation uses causing unacceptable resource impacts to return conditions to be within acceptable limits, or if not possible, stop the use and rehabilitate the affected areas.

FW-122: Do not encourage recreation use of rare communities.

FW-123: The search for treasure trove, that is money, un-mounted gems, precious metals or other high value items deliberately hidden with the intention of later recovery (but not including geo-caching) will only be allowed as authorized by a special use permit, including any specific case-by-case restrictions.

FW-124: Recreational metal detecting is not allowed, except in areas that do not contain, or would not reasonably be expected to contain, archaeological or historical resources (such as swimming beaches or picnic areas). It must be for lawful purposes (i.e. does not violate the Archaeological Resources Protection Act or CFR 36 261.9). Under these conditions, the collection of items not deliberately hidden with the intention of later recover is permissible without a permit. Individual management prescriptions may prohibit metal detecting.

Trails- General

FW-125: Forest Supervisor closure orders for existing trails or use areas will be used when necessary to manage environmental impacts and to protect public safety.

FW-126: OHV use is on designated routes only, that is, no public cross country travel is allowed.

FW-127: Horse, pack stock, and bike use in on designated routes only, that is, no public cross country travel is allowed. Routes include authorized trails, open roads, and close roads unless otherwise posted.

FW-128: Acceptance of existing travelways or creation of new trails will comply with direction within individual management prescriptions.

FW-129: During active projects, all trails, ditches, and other associated improvements in the project area are kept free of logs, slash, and debris. Any trail, ditch, or other improvement damaged by operations is promptly repaired.

FW-130: During construction, stabilize trail stream crossing segments that are within 100 feet of the stream measured perpendicular to the stream bank before continuing construction outside this area whenever aquatic T&E species occur within one stream mile downstream of the crossing.

FW-131: To minimize the length of streamside disturbance, ensure that trail approach sections are aligned at or as near right angles as possible to the stream channel. Locate riparian corridor crossings to minimize the amount of fill material needed to minimize channel impacts.

FW-132: When the level of recreational trail use has degraded water control structures resulting in sediment reaching a stream, the situation will be mitigated by utilizing all appropriate corrective measures scaled in intensity to the degree of the problem, up to trail closure if necessary.

FW-133: Prohibit rock climbing at T&E and sensitive plant and animal locations through coordination with recreation and natural resources staff. Divert new and existing hiking trails awway from these sites and use barriers and signs to close access, if needed.

FW-134: New trails other than hiking trails will be located outside of the riparian corridor, except at designated crossings or where the trail location requires some encroachment (e.g. to accommodate stream crossings in steep terrain, etc.). Hiking trails and boardwalks may be considered on a project-level basis, if consistent with riparian corridor desired conditions.

FW-135: All new stream crossings for system trails will be constructed so that they do not adversely affect the passage of aquatic organisms, or significantly alter the natural flow regime. Exceptions may be allowed to prevent the upstream migration of undesired species.

FW-136: Where projects to expand the trail system are under consideration, give priority to: (1) the re-use of existing travel ways that meet all applicable plan standards and all Forest Service trails handbook requirements, and (2) the reuse of existing travel ways that can be made to meet the standards more cost effectively than new construction.

FW-137: Motorized and non-motorized trail reconstruction and relocation within the ephemeral stream zone is allowed when needed to reduce impacts to riparian and aquatic resources.

Trails- Non-motorized

FW-145: Development of new hiking trails is constrained by individual management prescriptions.

FW-146: Camping with horses and pack stock is restricted to designated and posted equestrian camping areas. Refer to Management Prescription 11, Riparian Corridors, stand 11-015.

FW-147: Newly constructed horse trails will be a minimum of five miles in length, except when linked with an existing system such as a connector from a new trailhead or interior cross-connection.

FW-148: New non-motorized trail construction within the ephemeral stream zone is allowed when needed to replace existing trail configuration and improve access.

Management Prescriptions

7.E.1 Dispersed Recreation Areas

Emphasis
These areas receive moderate to high recreation use and are managed to provide the public with a variety of recreation opportunities in a setting that provides quality scenery, numerous trails and limited facilities. The management emphasis is to improve the settings for non-formal outdoor recreation in a manner that protects and restores the health, diversity, and productivity of the watersheds.

Desired Condition
This area will be managed on monitored to absorb moderate to high levels of use with minimal improvements while protecting soil, vegetation, and water resource conditions.

A visually-appealing landscape is achieved by providing vista openings, featuring special attractions like rock outcroppings and waterfalls, and by providing park-like stands and a diversity of vegetation species and age classes. The predominant landscape is natural appearing with variatinos of structurally diverse mid-to late-successional communities. Small and medium patches of old-growth forest communities, as well as small canopy gaps would develop over time throughout the area. Up to 4% of forested land may be in early-successional forest conditions created both naturally and through management. Approximately 85% of the forest cover in these areas would be mid-to late-successional communities with potential old growth forests. The scenic integrity objectives would be Moderate to High. Where possible, management changes are designed to be in low-contrast with pre-treatment conditions and therefore compatible with the SIO.

Existing old fields and openings for wildlife may be present, maintained, and expanded. New openings may also occur. Native species are emphasized when establishing food plants for wildlife. Some openings provide permanent shrub/sapling habitats as a result of longer maintenance cycles.

Visitors will be able to choose from a wide variety of high-quality, well-maintained, dispersed recreation opportunities such as camping, hiking, horseback riding, mountain biking riding, rock climbing, nature studying, hunting, fishing, and canoeing. Loop and interconnected trail systems will be available for use. Visitors will frequently see other people in some parts of this area. Sights and sounds of human activities will be evident in many locations. Trails will be maintained, improved, or expanded to meet local demands, provided the local ecosystem is not negatively affected. Outdoor skills are of moderate importance for visitors, except where knowledge of specialized activities such as horseback riding, mountain biking, rock climbing, is critical.

Visitors are informed to expect limited, rustic amenities. Signs are few, but adequate to guide visitors fromstate or county roads. Visitors are expected to be rather self-reliant and well-prepared. Monitoring of visitor satisfaction and expectations will be done periodically to assess how well these areas are meeting the Forst Plan Goals and Objectives. Search and rescue is readily available.

All roads, facilities, and signing are designed to blend in with surroundings. Roads are well located, stable and suitable for use by the types of vehicles and during the use periods appropriate to the achievement of the

emphasis for the area. Total system road density remans near the average density of Forest Service jurisdiction roads in the ecological section. Existing open public roads are maintained at or above current levels to provide for public access and parking safety. Capacity of facilities is typically low, and they are rustic in character. Construction of new facilities is limited and usually done in response to the need to correct environmental problems rather than increase capacity.

There will be good-to-optimal habitat conditions for species favoring mid-to late-successional forest conditions. Management and/or protection of rare communities and species associates will be provided, along with management and/or protection measures for population occurrences for threatened, endangered, sensitive, and locally rare species. Habitat for a broad mix of species will also be provided.

Streams and water bodies are periodically inventoried and monitored on an individual stream basis to characterize conditions or trends. Streams and water bodies are protected from adverse effects. Aquatic habitat management activities are allowed to maintain, restore and enhance aquatic habitat conditions and and associated communities of native, desired nonnative, and /or demand species. Management activities will be coordinated with the Georgia Department of Natural Resources.

Systematic landscape surveys will be conducted periodically on a sample basis for population health and trends of PETS species. Once identified, locations of proposed, endangered, and threatened species populations are geo-referenced, generally as a point, and monitored periodically, but not necessarily annually. Data collected is typically basic population-level (polygon) data. Active management to maintain habitat of known populations may occur with the written concurrence of the USFWS where a beneficial effect to the species has been established. National Forests will manage for the viability of all native and desirable nonnative species occurring on the Forest, including huntable of fishable populations of terrestrial and aquatic demand species.

Inventories will be conducted to identify significant heritage resources requiring monitoring and protection. The priority of heritage resource inventory areas will focus on known heritage resources, the probability of sites containing significant heritage resources, an areas of popular use such as trails and campsites.

Objective
OBJ-7.E.1-01: Manage forest successional stages to maintain a minimum of 75 percent of forested acreas in mi-and late-successional forest, including old growth; a minimum of 50 percent of forest acres in late-successional forest, including old growth; and up to 4 percent per decae in early-successional forest.

Standards
Lands and Special Uses
7.E.1-001: New utility corridors or communication sites may be authorized subject to applicable forestwide and management prescription standards.

Minerals and Geology
7.E.1-002: Using lease terms for environmental protection, Federal mineral leases and mineral material authorizations would be allowed.

Vegetation and Forest Health
7.E.1-003: Insect and disease outbreaks may be controlled when necessary to protect the values for which the area was allocated; to reduce hazards to visitor for safety or legal reasons to protect adjacent resources; or to protect ecosystem composition, structure, and function.

Recreation
7.E.1-004: Areas will be managed to meet or exceed ROS settings RN1, RN2, SPM, and SPNM.

7.E.1-005: OHV trail systems are permissible provided screening criteria have been met.

Scenery
7.E.1-006: Management activities are designed to meet or exceed the following Scenic Integrity Objectives, whch vary by Inventoried Scenic Class

Inventoried Scenic Class	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Scenic Integrity Objectives	H	M	M	M	M	M	M

Facilities, Roads, and Access
7.E.1-007: This prescription includes portions of the Pink Knob and Rock Mountain inventoried roadless ares. Management actions in any one of them will not violate Forest Service roadless criteria at the scale of each entire inventoried roadless area.

Timber Management
7.E.1-008: These lands are classified under NFMA as unsuitable for timber production; not appropriate however, salvage sales, sales necessary to protect other multiple-use values, or activities that meet other Plan goals and objectives are permitted.

Successional Stage Management
7.E.1-009: Creation of early-successional forest habitat is limited to 4 percent of forested acres. Existing patches of early-successional forest grater than two acres in size are included when calculations allowable levels of early-successional forest creation.

Red-cockaded Woodpecker Protection
7.E.1-010: On that portion of the Oconee National Forest south of Interstate 20, the requirements of the USDI Fish and Wildlife Service January 2003 RCW Recovery Plan and its amendments must be complied with in each management prescription.

Appendix B: USFS Trail Fundamentals (Excerpts)

18 – Exhibit 01

TRAIL OPERATION AND MAINTENANCE CONSIDERATIONS

Trail Operation and Maintenance Considerations are general guidelines for developing trail prescriptions and managing, operating, and maintaining National Forest System trails. The considerations are a starting point and likely will need to be adapted to reflect local financial capability and other circumstances. Exceptions to the Trail Operation and Maintenance Considerations may occur at the trail-specific, district, forest or grassland, or regional level.

Trail Attributes	Trail Class 1 Minimally Developed	Trail Class 2 Moderately Developed	Trail Class 3 Developed	Trail Class 4 Highly Developed	Trail Class 5 Fully Developed
Trail Management	Typically managed to accommodate: ◆ Low use levels ◆ Highly skilled users who are comfortable off-trail ◆ Users with high degree of orienteering skill ◆ Some travel modes and ability levels may be impractical or impossible and may not be encouraged ◆ Water Trails: users with high level of navigation/orientation and paddling skills	Typically managed to accommodate: ◆ Low-to-moderate use levels ◆ Moderately to highly skilled users, capable negotiating obstacles ◆ Users with moderate orienteering skill ◆ Many types of uses, but challenging and requires advanced skills ◆ Water Trails: users with moderate to high level of navigation/orientation and paddling skills	Typically managed to accommodate: ◆ Moderate to heavy use ◆ Users with intermediate skill level and experience ◆ Users with minimal orienteering skills ◆ Moderately easy travel by Managed Uses ◆ Water Trails: basic to moderate navigating and paddling skills required Random potential for accessible use	Typically managed to accommodate: ◆ Very heavy use ◆ Users with minimal skills and experience ◆ Users with minimal or no orienteering skills ◆ Easy travel by Managed Uses ◆ Water Trails: basic navigating and paddling skills required May be or has potential to be made accessible	Typically managed to accommodate: ◆ Intensive use ◆ Users with limited skills and experience Typically meets agency requirements for accessibility
Maintenance Indicators	◆ Resource protection ◆ Safety commensurate with targeted recreation experience	◆ Resource protection ◆ Safety commensurate with targeted recreational experience	◆ Resource protection ◆ User convenience ◆ Safety commensurate with targeted recreation experience	◆ User comfort and ease ◆ Resource protection ◆ Safety commensurate with targeted recreation experience	◆ User comfort and ease ◆ High level of accessibility for Managed Uses ◆ Safety commensurate with targeted recreation experience
Routine Maintenance Frequency and Intensity [1]	◆ Infrequent or no scheduled maintenance ◆ Typically, maintenance conducted every 5 or more years or in response to reports of unusual resource problems requiring repair	◆ Maintenance scheduled to preserve the trail and its location ◆ Typically, maintenance conducted every 3-5 years or in response to reports of unusual resource problems requiring repair	◆ Trail cleared for availability early in its season of use and for preservation of its integrity ◆ Typically, maintenance conducted every 1-3 years or in response to reports of trail or resource damage or significant obstacles to Managed Use and experience level	◆ Trail cleared at earliest opportunity to make it available for season of use ◆ Typically, maintenance conducted at least annually	◆ Typically, maintenance conducted at least annually, or as needed to meet posted conditions ◆ Typically, major damage or safety concerns corrected or posted within 24 hours of discovery

[1] Maintenance in this category does not include routine trail condition assessment surveys.

23.11 - Exhibit 01

HIKER/PEDESTRIAN DESIGN PARAMETERS

Design Parameters are technical guidelines for the survey, design, construction, maintenance, and assessment of National Forest System trails, based on their Designed Use and Trail Class and consistent with their management intent[1]. Local deviations from any Design Parameter may be established based on trail-specific conditions, topography, or other factors, provided that the deviations are consistent with the general intent of the applicable Trail Class.

Designed Use HIKER/PEDESTRIAN		Trail Class 1	Trail Class 2	Trail Class 3 [2]	Trail Class 4 [2]	Trail Class 5 [2]
Design Tread Width	**Wilderness** (Single Lane)	0" – 12"	6" – 18"	12" – 24" Exception: may be 36" – 48" at steep side slopes	18" – 24" Exception: may be 36" – 48" at steep side slopes	Not applicable
	Non-Wilderness (Single Lane)	0" – 12"	6" – 18"	18" – 36"	24" – 60"	36" – 72"
	Non-Wilderness (Double Lane)	36"	36"	36" – 60"	48" – 72"	72" – 120"
	Structures (Minimum Width)	18"	18"	18"	36"	36"
Design Surface[3]	**Type**	Native, ungraded May be continuously rough	Native, limited grading May be continuously rough	Native, with some on-site borrow or imported material where needed for stabilization and occasional grading Intermittently rough	Native with improved sections of borrow or imported material, and routine grading Minor roughness	Likely imported material, and routine grading Uniform, firm, and stable
	Protrusions	≤ 24" Likely common and continuous	≤ 6" May be common and continuous	≤ 3" May be common, not continuous	≤ 3 " Uncommon, not continuous	No protrusions
	Obstacles (Maximum Height)	24"	14"	10"	8"	No obstacles

Designed Use HIKER/PEDESTRIAN		Trail Class 1	Trail Class 2	Trail Class 3 [2]	Trail Class 4 [2]	Trail Class 5 [2]
Design Grade[3]	**Target Grade**	5% – 25%	5% – 18%	3% – 12%	2% – 10%	2% – 5%
	Short Pitch Maximum	40%	35%	25%	15%	5% FSTAG: 5% – 12%[2]
	Maximum Pitch Density	20% – 40% of trail	20% – 30% of trail	10% – 20% of trail	5% – 20% of trail	0% – 5% of trail
Design Cross Slope	**Target Cross Slope**	Natural side slope	5% – 20%	5% – 10%	3% – 7%	2% – 3% (or crowned)
	Maximum Cross Slope	Natural side slope	25%	15%	10%	3%
Design Clearing	**Height**	6'	6' – 7'	7' – 8'	8' – 10'	8' – 10'
	Width	≥ 24" Some vegetation may encroach into clearing area	24" – 48" Some light vegetation may encroach into clearing area	36" – 60"	48" – 72"	60" – 72"
	Shoulder Clearance	3" – 6"	6" – 12"	12" – 18"	12" – 18"	12" – 24"
Design Turn	**Radius**	No minimum	2' – 3'	3' – 6'	4' – 8'	6' – 8'

[1] For definitions of Design Parameter attributes (e.g., Design Tread Width and Short Pitch Maximum), see FSH 2309.18, section 05.

[2] Trail Classes 3, 4, and 5, in particular, have the potential to be accessible. If assessing or designing trails for accessibility, refer to the Forest Service Trail Accessibility Guidelines (FSTAG) for more specific technical provisions and tolerances (FSM 2350).

[3] The determination of the trail-specific Design Grade, Design Surface, and other Design Parameters should be based upon soils, hydrological conditions, use levels, erosion potential, and other factors contributing to surface stability and overall sustainability of the trail.

23.12 - Exhibit 01

PACK AND SADDLE DESIGN PARAMETERS

Design Parameters are technical guidelines for the survey, design, construction, maintenance, and assessment of National Forest System trails, based on their Designed Use and Trail Class and consistent with their management intent[1]. Local deviations from any Design Parameter may be established based on trail-specific conditions, topography, or other factors, provided that the deviations are consistent with the general intent of the applicable Trail Class.

Designed Use PACK AND SADDLE		Trail Class 1	Trail Class 2	Trail Class 3	Trail Class 4	Trail Class 5
Design Tread Width	**Wilderness** (Single Lane)	Typically not designed or actively managed for equestrians, although use may be allowed	12" – 18" May be up to 48" along steep side slopes 48" – 60" or greater along precipices	18" – 24" May be up to 48" along steep side slopes 48" – 60" or greater along precipices	24" May be up to 48" along steep side slopes 48" – 60" or greater along precipices	Typically not designed or actively managed for equestrians, although use may be allowed
	Non-Wilderness (Single Lane)		12" – 24" May be up to 48" along steep side slopes 48" – 60" or greater along precipices	18" – 48" 48" – 60" or greater along precipices	24" – 96" 48" – 60" or greater along precipices	
	Non-Wilderness (Double Lane)		60"	60" – 84"	84" – 120"	
	Structures (Minimum Width)		Other than bridges: 36" Bridges without handrails: 60" Bridges with handrails: 84" clear width	Other than bridges: 36" Bridges without handrails: 60" Bridges with handrails: 84" clear width	Other than bridges: 36" Bridges without handrails: 60" Bridges with handrails: 84" clear width	
Design Surface[2]	**Type**		Native, with limited grading May be frequently rough	Native, with some on-site borrow or imported material where needed for stabilization and occasional grading Intermittently rough	Native, with improved sections of borrow or imported material and routine grading Minor roughness	

Designed Use PACK AND SADDLE		Trail Class 1	Trail Class 2	Trail Class 3	Trail Class 4	Trail Class 5
Design Surface (continued)	**Protrusions**		≤ 6" May be common and continuous	≤ 3" May be common, not continuous	≤ 3" Uncommon, not continuous	
	Obstacles (Maximum Height)		12"	6"	3"	
Design Grade[2]	**Target Grade**		5% – 20%	3% – 12%	2% – 10%	
	Short Pitch Maximum		30%	20%	15%	
	Maximum Pitch Density		15% – 20% of trail	5% – 15% of trail	5% – 10% of trail	
Design Cross Slope	**Target Cross Slope**		5% – 10%	3% – 5%	0% – 5%	
	Maximum Cross Slope		10%	8%	5%	
Design Clearing	**Height**		8' – 10'	10'	10' – 12'	
	Width		72" Some light vegetation may encroach into clearing area	72" – 96"	96"	
	Shoulder Clearance		6" – 12" Pack clearance: 36" x 36"	12" – 18" Pack clearance: 36" x 36"	12" – 18" Pack clearance: 36" x 36"	
Design Turn	**Radius**		4' – 5'	5' – 8'	6' – 10'	

[1] For definitions of Design Parameter attributes (e.g., Design Tread Width and Short Pitch Maximum), see FSH 2309.18, section 05.

[2] The determination of the trail-specific Design Grade, Design Surface, and other Design Parameters should be based upon soils, hydrological conditions, use levels, erosion potential, and other factors contributing to surface stability and overall sustainability of the trail.

23.13 – Exhibit 01

BICYCLE DESIGN PARAMETERS

Design Parameters are technical guidelines for the survey, design, construction, maintenance, and assessment of National Forest System trails, based on their Designed Use and Trail Class and consistent with their management intent[1]. Local deviations from any Design Parameter may be established based on trail-specific conditions, topography, or other factors, provided that the deviations are consistent with the general intent of the applicable Trail Class.

Designed Use BICYCLE		Trail Class 1	Trail Class 2	Trail Class 3	Trail Class 4	Trail Class 5
Design Tread Width	**Single Lane**	6" – 12"	12" – 24"	18" – 36"	24" – 48"	36" – 60"
	Double Lane	36" – 48"	36" – 48"	36" – 48"	48" – 84"	72" – 120"
	Structures (Minimum Width)	18"	18"	36"	48"	60"
Design Surface[2]	**Type**	Native, ungraded May be continuously rough Sections of soft or unstable tread on grades < 5% may be common and continuous	Native, with limited grading May be continuously rough Sections of soft or unstable tread on grades < 5% may be common	Native, with some on-site borrow or imported material where needed for stabilization and occasional grading Intermittently rough Sections of soft or unstable tread on grades < 5% may be present, but not common	Native, with improved sections of borrow or imported materials and routine grading Stable, with minor roughness	Likely imported material and routine grading Uniform, firm, and stable
	Protrusions	≤ 24" Likely common and continuous	≤ 6" May be common and continuous	≤ 3" May be common, but not continuous	≤ 3" Uncommon and not continuous	No protrusions
	Obstacles (Maximum Height)	24"	12"	10"	8"	No obstacles

Designed Use BICYCLE		Trail Class 1	Trail Class 2	Trail Class 3	Trail Class 4	Trail Class 5
Design Grade [2]	**Target Grade**	5% – 20%	5% – 12%	3% – 10%	2% – 8%	2% – 5%
	Short Pitch Maximum	30% 50% on downhill segments only	25% 35% on downhill segments only	15%	10%	8%
	Maximum Pitch Density	20% – 30% of trail	10% – 30% of trail	10% – 20% of trail	5% – 10% of trail	0% – 5% of trail
Design Cross Slope	**Target Cross Slope**	5% – 10%	5% – 8%	3% – 8%	3% – 5%	2% – 3%
	Maximum Cross Slope	10%	10%	8%	5%	5%
Design Clearing	**Height**	6'	6' – 8'	8'	8' - 9'	8' - 9'
	Width	24" – 36" Some vegetation may encroach into clearing area	36" – 48" Some light vegetation may encroach into clearing area	60" – 72"	72" – 96"	72" – 96"
	Shoulder Clearance	0' – 12"	6" – 12"	6" – 12"	6" – 18"	12" – 18"
Design Turn	**Radius**	2' – 3'	3' – 6'	4' – 8'	8' – 10'	8' - 12'

[1] For definitions of Design Parameter attributes (e.g., Design Tread Width and Short Pitch Maximum), see FSH 2309.18, section 05.

[2] The determination of the trail-specific Design grade, Design Surface, and other Design Parameters should be based upon soils, hydrological conditions, use levels, erosion potential, and other factors contributing to surface stability and overall sustainability of the trail.

Appendix C: On-Line Survey Sample Text and Graph Interpretation

Chattahoochee-Oconee National Forest Trail Assessment

1. Introduction

The USFS has partnered with Georgia Forest Watch, CO-Trails, Applied Trails Research, Kay-Linn Enterprises, and Trail Dynamics to assess 220+ miles of non-motorized trail in four Georgia Ranger Districts. The information that you provide in this survey will be used to guide the consultants' field assessment of each of these trails, as well as the final recommendations regarding each of these trails.

The survey includes a total of 57 trails, in 4 Ranger Districts, specifically the Physical (condition of the trail), Social (trail use), Managerial Settings (trail management) of each individual trail. This survey has been distributed to USFS staff, volunteers, and trail users.

Directions:
The survey is divided into 61 pages, each titled with a Ranger District and/or Trail name and number (in Brown at the top of each page). You will be asked if you are familiar with the specific Ranger District or trail. If you answer "No", you will be automatically redirected to the next Ranger District or trail. You will be able to return to questions until you "EXIT" the survey.

Ranger Districts:
Conasauga Ranger District (12 Trails)
Blue Ridge Ranger District (13 Trails)
Chattooga River Ranger District (24 Trails)
Oconee Ranger District (8 Trails)

1. Are you

- ○ USFS employee
- ○ Other

2. Please provide your name and USFS Position or Volunteer Affiliation.

Name	
Position/Affiliation	

Chattahoochee-Oconee National Forest Trail Assessment

2. Conasauga Ranger District

1. CONASAUGA RANGER DISTRICT:

Are you familiar with the Conasauga Ranger District?

If you answer "Yes", you will be forwarded to the assessment of trails in this district.

If you answer "No", you will be forwarded to the Blue Ridge Ranger District.

- ○ Yes (ASSESS TRAILS IN THIS DISTRICT)
- ○ No (SKIP TO BLUE RIDGE RANGER DISTRICT)

Chattahoochee-Oconee National Forest Trail Assessment

3. Conasauga Ranger District - Panther Creek Trail # 116

1. Are you familiar with this trail? If you answer "No", you will be forwarded on to the next trail in this Ranger District's Assessment.

- ○ Yes
- ○ No

2. Approximately, how many times have you been on this trail over the past 2 years (January 2010 - January 2012)?

- ○ 1
- ○ 2-5
- ○ 5-7
- ○ 7-12
- ○ 12+

3. PHYSICAL SETTING/SUSTAINABILITY

Please rank the following elements of the physical trail condition.

	Extremely good	Moderately good	Neither good nor bad	Moderately bad	Extremely bad
Trail Corridor Condition (i.e. vegetation encroachment, downfall, hazard trees)	○	○	○	○	○
Trail Tread Condition (roughness, muddiness, widening, spur trails, sloughing/narrowing, eroding)	○	○	○	○	○
Trail Grade (sections are too steep or too flat)	○	○	○	○	○
Water Management Structures (water bars, grade dips, culverts, turnpikes)	○	○	○	○	○
Trail Structures Condition (bridges, boardwalks, overlooks)	○	○	○	○	○

Chattahoochee-Oconee National Forest Trail Assessment

4. SOCIAL SETTING/SUSTAINABILITY

Please assess your satisfaction with your experience on this trail.

	Extremely satisfied	Very satisfied	Moderately satisfied	Slightly satisfied	Not at all satisfied
Quality of trail experience	○	○	○	○	○
Potential user conflict is minimized by the trail design (appropriate tread width, clear intersections, volume of use)	○	○	○	○	○
Condition of trailhead/trailside facilities (parking, sanitation, mapping/info, resources, signage)	○	○	○	○	○

5. MANAGERIAL SETTING/SUSTAINABILITY

Please rank the effectiveness of the current management of this trail.

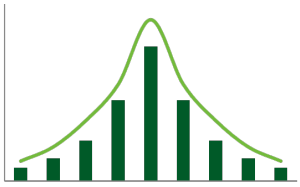
	Extremely effective	Very effective	Moderately effective	Slightly effective	Not at all effective
General maintenance condition (quality, quantity)	○	○	○	○	○
Capacity to manage (volunteer and agency access to tools, training, and manpower)	○	○	○	○	○
Meeting current and/or projected use	○	○	○	○	○
Compatibility with surrounding resources (wildlife resources, water quality, developed condition of the area)	○	○	○	○	○

When interpreting data, it is important to consider its properties carefully. Range, variance and skewness are basic properties of data. These terms describe spread, agreement and balance within data. The **range** if data is its extent across the domain of possible response values – *extremely effective* to *not at all effective* in this case. The **Variance** of a data characterizes agreement within the dataset. **Skewness** describes the lopsidedness or balance of data across its range. Taken together, these properties supply a picture of the data and its characteristics.

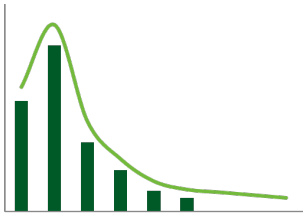
Examples will help to illustrate the properties and illustrate how the charts presented in this report can be interpreted. Four distributions of data, depicted below are use in the example: uniform, normal, skew, extremes. Each of these distributions is hypothetical and exaggerates characteristics of range, variance and skewness.

The uniform distribution is flat. Each possible value in has the same number of responses. The data range spans the full domain. Variance is high as many different responses are represented. Skewness is low with balance on either side of the midpoint. There is little agreement within the data and respondents may not feel strongly about the item.

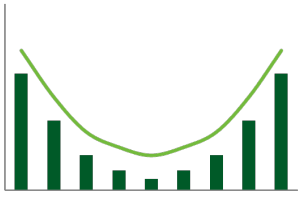
The normal distribution takes the classic form of a bell curve. A value near the center of the range appears most commonly, with other values appearing less frequency as they become more distant from the center. Variance is relatively low, decreasing on either side of the most common response. Skewness is low as well, with balance on either side of the midpoint. There is agreement within the data, about the midpoint, and relatively equivalent disagreement on either side of the midpoint. Such midpoint agreement may, however, represent moderation or ambivalence.



The skewed distribution is similar to a normal distribution, but shifted left or right of the range's midpoint. Skewed distributions often have truncated ranges. Their variance is low, with most responses concentrated near one end of the data's range. Skewness is high, eponymous of the distribution, appearing lopsided or unbalanced with respect to the range's midpoint. A skewed distribution represents high agreement toward a specific direction.



The extreme distribution is a reverse of the normal distribution. Reponses at the ends of a range are most common with decreasing frequency approaching the midpoint. Variance within the data is high as large numbers of responses are very different. Skewness is, however, low, with balance about the range's midpoint. Extreme distributions denote strong disagreement between groups that, within themselves, agree.

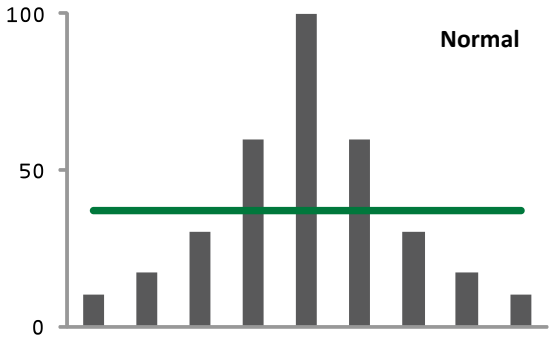


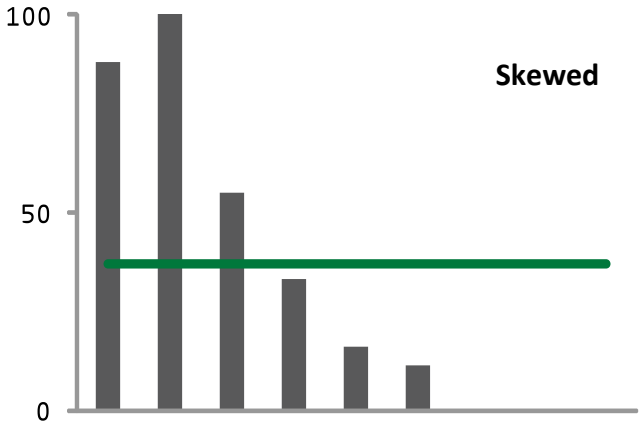
The meaning of data is illustrated through the properties of range, variance and skewness. Match characteristics of these examples to the patterns of data presented in this report. Use them to ask questions like "Do respondents feel strongly about a topic?" and "Do they agree?" Mix and match the significant elements of these examples across more complex data, building partial inferences to whole conclusions.

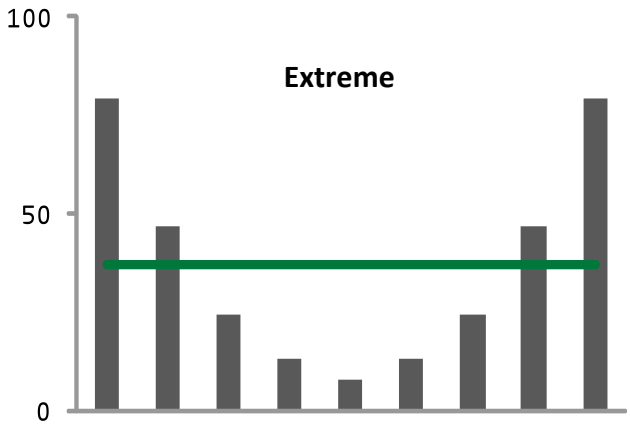
Data is often summarized and described using statistics. Among the most common of these are measures of central tendency. Central tendency is clustering about some value. Often, this central value is thought of as the "middle" of a dataset and assumed to be of some essential quality. While central tendencies and values are can be informative and useful, it is important to understand their meanings. Measures of central tendency can simultaneously highlight and obscure the data.

Depending on the properties of a dataset, means can be misleading. Indeed, some datasets can share similar means and have very different properties. The three charts below illustrate this. When considering which measure of central tendency is appropriate to use, or when comparing measures from different datasets, these it is important to examine these differences. The table below presents three datasets corresponding to normal, skewed and extreme distributions. Each distribution has the same number of observations (N=334) and the same mean (37). Yet, the distributions are very different as evidenced by their shapes, medians and modes. For the normal distribution, the mean and median are close, 37 and 30 respectively, and validly reflect the central tendency inherent in normal distributions. The skewed distribution has the same mean as the normal distribution, but most of the responses are clearly skewed in one direction. In this case the mean may suggest a more moderate position than the data's distribution. The extreme distribution shares the same mean as the normal distribution, but the data are arranged in an opposite pattern. Such an extreme pattern suggests ambivalence or opposition that can be obscured by sole reliance on a mean.

	Normal	Skew	Extreme
not	10	88	79
effective	17	131	47
	30	55	24
	60	33	13
	100	16	8
	60	11	13
	30	0	24
very	17	0	47
effective	10	0	79
N	334	334	334
Mean	37	37	37







Appendix D: Trail Impacts Literature Review

Introduction
Much research has been conducted to analyze recreational impacts to public lands; some of this research has focused on understanding impacts of different types of recreational use on trails, trail systems and the natural settings in which trails exist.

Trails are generally regarded as essential facilities in parks and forests. They provide access to remote areas, accommodate a diverse array of recreational activities, and protect resources by concentrating visitor trampling on narrow and resistant tread surfaces. Formal or designated trails are generally designed and constructed, which involves vegetation removal and soil excavation. These changes may be considered "unavoidable," in contrast to "avoidable" post-construction degradation from their subsequent use (e.g., trail widening, erosion, muddiness), or from the development and degradation of informal visitor-created trails.

Common environmental impacts associated with recreational use of trails include:

- Vegetation loss and compositional changes
- Soil compaction
- Erosion
- Muddiness
- Degraded water quality
- Disruption of wildlife

This review is organized into four broad categories: impacts to vegetation, soil, water, and wildlife.

Impacts to Vegetation: General Research
On formal trails, most vegetation is typically removed by construction, maintenance, and visitor use. This impact is necessary and "unavoidable" in order to provide a clear route for trail users. One goal of trail construction and maintenance is to provide a trail only wide enough to accommodate the intended use. Trails made wider than this through visitor use or erosion represent a form of "avoidable" impact. For example, a doubling of trail width represents a doubling of the area of intensive trampling disturbance. Wider trails also expose substantially greater amounts of soil to erosion by wind or water.

The creation and maintenance of trail corridors also removes shrubs and trees, allowing greater sunlight exposure that favors a different set of groundcover plants within trail corridors. Occasional trailside trampling within trail corridors also favors the replacement of fragile plants with those more resistant to trampling traffic. For example, shade-tolerant but fragile broadleaved herbs are frequently replaced by grasses and sedges that are trampling-resistant and require more sunlight to survive. Trail construction, use, and maintenance can also be harmful when trails divide sensitive or rare plant communities.

Trampling - the action of crushing or treading upon vegetation, either by foot, hoof, or tire - contributes to a wide range of vegetation impacts, including damage to plant leaves, stems, and roots, reduction in vegetation height, change in the composition of species, and loss of plants and vegetative cover (Leung & Marion, 1996; Thurston & Reader, 2001). Trampling associated with "avoidable" off-trail traffic can quickly break down vegetation cover and create a visible route that attracts additional use. Complete loss of vegetation cover occurs quickly in shady forested areas, less quickly in open areas with resistant grassy vegetation. Regardless, studies have consistently revealed that most impact occurs with initial or low use, with a diminishing increase in impact associated with increasing levels of traffic (Hammit & Cole, 1998; Leung & Marion, 1996). Furthermore, once trampling occurs, vegetative recovery is a very slow process.

Compositional changes in the vegetation along trail corridors* can have both beneficial and adverse effects. Trampling-resistant plants provide a durable groundcover that reduces soil loss by wind and water runoff, and root systems that stabilize soils against displacement by heavy traffic. The ecological impacts of such compositional changes are not fully known, except when non-native vegetation is introduced to and spreads along trail corridors. Many of these species are disturbance-associated and are naturally limited to areas where the vegetation is routinely trampled or cut back. However, a few non-native species, once introduced to trail corridors, are able to out-compete native plants and spread away from the trail corridor in undisturbed habitats. Some of these species form dense cover that crowd out or displace native plants. These "invasive" species are particularly undesirable and land managers actively seek to prevent their introduction and spread. Unfortunately their removal is difficult and expensive.

See Wells and Lauenroth 2007 for a case study examining horse and pack stock as dispersal mechanism for plants along recreational trails.

Impacts to Vegetation: Management Implications

Trail managers can either avoid or minimize impacts to vegetation through careful trail design, construction, maintenance, and management of visitor use. Here are some recommendations to reduce vegetation impacts:

- Design trails that provide the experience that trail users seek to reduce their desire to venture off-trail.
- Locate trails away from rare plants and animals and from sensitive or critical habitats of other species. Involve resource professionals in designing and approving new trail alignments.
- Keep trails narrow to reduce the total area of intensive tread disturbance, slow trail users, and minimize vegetation and soil impacts.
- Limit vegetation disturbance outside the corridor when constructing trails. Hand construction is least disruptive; mechanized construction with small equipment is less

disruptive than full-sized equipment; skilled operators do less damage than those with limited experience.

- Locate trails on side-hills where possible. Constructing a side-hill trail requires greater initial vegetation and soil disturbance but sloping topography above and below the trail bench will clearly define the tread and concentrate traffic on it. Trails in flatter terrain or along the fall line may involve less initial disturbance but allow excessive future tread widening and off-tread trampling, which favor non-native plants.
- Construct and formalize meet-up and "tie-up" areas in a fashion that contains and concentrates visitor use to durable surfaces
- Use construction techniques that save and redistribute topsoil and excavated plants.

There are also important considerations for maintaining and managing trails to avoid unnecessary ongoing impacts to vegetation:

- While it is necessary to keep the trail corridor free of obstructing vegetation, such work should seek to avoid "day-lighting" the trail corridor when possible. Excessive opening of the overstory allows greater sunlight penetration that permits greater vegetation compositional change and colonization by non-native plants.
- An active maintenance program that removes tree falls and maintains a stable and predictable tread also encourages visitors to remain on the intended narrow tread. A variety of maintenance actions can discourage trail widening, such as only cutting a narrow section out of trees that fall across the trail, limiting the width of vegetation trimming, and defining trail borders with logs, rocks, or other objects that won't impede drainage.
- Use education to discourage off-trail travel, which can quickly lead to the establishment of informal visitor-created trails that unnecessarily remove vegetation cover and spread non-native plants. Such routes often degrade rapidly and are abandoned in favor of adjacent new routes, which unnecessarily magnify the extent and severity of trampling damage.
- Educate visitors to be aware of their ability to carry non-native plant seeds on their bikes or clothing, and encourage them to remove seeds by washing mud from bikes, tires, shoes, and clothing. Preventing the introduction of non-natives is key, as their subsequent removal is difficult and costly.
- Educate visitors about low impact riding practices, such as those contained in the IMBA-approved Leave No Trace Skills & Ethics: Mountain Biking booklet (www.LNT.org).

For further reading see: Pickering et al 2010, Cessford 1995; Gruttz and Hollingshead 1995; Thurston and Reader 200l.

Impacts to Soils: General Research

The creation and use of trails also results in soil disturbance. Some loss of soil may be considered an acceptable and unavoidable form of impact on trails. As with vegetation loss, much soil disturbance occurs in the initial construction and use of the trail. During trail construction, surface organic materials (e.g., twigs, leaves, and needles) and organic soils are removed from treads; trails built on sidehill locations require even more extensive excavation. In addition, the underlying mineral soils are compacted during construction and initial use to form a durable tread substrate that supports trail traffic.

In contrast, post-construction soil displacement, erosion, and muddiness represent core forms of avoidable trail impact that require sustained management attention to avoid long-lasting resource degradation. This degradation can reduce the utility of trails as recreation facilities and diminish the quality of visitor experiences. For example, soil erosion exposes rocks and plant roots, creating a rutted and uneven tread surface. Erosion can also be self-perpetuating when treads erode below the surrounding soil level, hindering efforts to divert water from the trail and causing accelerated erosion and muddiness. Similarly, excessive muddiness renders trails less usable and aggravates tread widening and associated vegetation loss as visitors seek to circumvent mud holes and wet soils (Marion, 2006).

Research has shown that visitors notice obvious forms of trail impact, such as excessive muddiness and eroded ruts and tree roots, and that such impacts can degrade the quality of visitor experiences (Roggenbuck and others., 1993; Vaske and others., 1993). Such conditions also increase the difficulty of travel and may threaten visitor safety. Remedying these soil impacts can also require substantial rehabilitation costs. Clearly, one primary trail management objective should be the prevention of excessive soil impacts.

The Four Common Forms of Soil Degradation on Trails:

- Compaction
- Muddiness
- Displacement
- Erosion

Compaction

Soil compaction is caused by the weight of trail users and their equipment, which passes through feet, hooves, or tires to the tread surface. Compacted soils are denser and less permeable to water, which increases water runoff. However, compacted soils also resist erosion and soil

displacement and provide durable treads that support traffic. From this perspective, soil compaction is considered beneficial, and it is an unavoidable form of trail impact. Furthermore, a primary resource protection goal is to limit trailside impacts by concentrating traffic on a narrow tread. Success in achieving this objective will necessarily result in higher levels of soil compaction.

The process of compacting the soil can present a difficult challenge, especially on new trails. Unless soils are mechanically compacted during tread construction, initial use compacts the portions of the tread that receive the greatest traffic, generally the center. The associated lowering of the tread surface creates a cupped cross-section that intercepts and collects surface water. In flat terrain this water can pool or form muddy sections; in sloping terrain the water is channeled down the trail, gaining in volume, speed, and erosive potential.

Displacement
Trail users can also push soil laterally, causing displacement and development of ruts, berms, or cupped treads. Soil displacement is particularly evident when soils are damp or loose and when users are moving at higher rates of speed, turning, braking, or other movements that create more lateral force. Soil can also be caught in hooves, footwear, or tire treads, flicked to the side or carried some distance and dropped. Regardless of the mechanism, soil is generally displaced from the tread center to the sides, elevating inslopes or berms, and compounding drainage problems.

Muddiness
When trails are located in areas of poor drainage or across highly organic soils that hold moisture, tread muddiness can become a persistent problem. Muddiness is most commonly associated with locations where water flows across or becomes trapped within flat or low-lying areas. Soil compaction, displacement, and erosion can exacerbate or create problems with muddiness by causing cupped treads that collect water during rainfall or snowmelt. Thus, muddiness can occur even along trails where there is sufficient natural drainage. Subsequent traffic skirts these problem spots, compacting soils along the edges, widening mud holes and tread width, and sometimes creating braided trails that circumvent muddy sections.

Erosion
Soil erosion is an indirect and largely avoidable impact of trails and trail use. Soil can be eroded by wind, but generally, erosion is caused by flowing water. To avoid erosion, sustainable trails are generally constructed with a slightly crowned (flat terrain) or outsloped (sloping terrain) tread. However, subsequent use compacts and/or displaces soils over time to create a cupped or insloped tread surface that intercepts and carries water. The concentrated run-off picks up and carries soil particles downhill, eroding the tread surface.

Loose, uncompacted soil particles are most prone to soil erosion, so trail uses that loosen or detach soils contribute to higher erosion rates. Erosion potential is closely related to trail grade

because water becomes substantially more erosive with increasing slope. The size of the watershed draining to a section of trail is also influential - larger volumes of water are substantially more erosive.

Water and the sediment it carries will continue down the trail until a natural or constructed feature diverts it off the tread. Such features include a natural or constructed reversal in grade, an outsloped tread, rocks or tree roots, or a constructed drainage dip or water bar. Once the water slows, it drops its sediment load, filling in tread drainage features and causing them to fail if not periodically maintained. Sediment can also be carried directly into watercourses, creating secondary impacts to aquatic systems. Properly designed drainage features are designed to divert water from the trail at a speed sufficient to carry the sediment load well below the tread, where vegetation and organic litter can filter out sediments. A well-designed trail should have little to no cumulative soil loss, for example, less than an average of one-quarter inch (6.3 mm) per year.

Impacts to Soils

Many studies have evaluated the soil impacts of different types of recreational uses. The general consensus of this research has shown that motorized and equestrian use are significantly more impacting to soils than human powered recreation (hiking, trail running, cycling). The trail system at Cave Run Lake is showing significant signs of degraded soils as a result of heavy use, poor design and a general lack of appropriate maintenance.

Several key studies comparing the impacts to soils by user-type are reviewed below:
Wilson and Seney (1994) evaluated tread erosion from horses, hikers, mountain bikes, and motorcycles on two trails in the Gallatin National Forest, Montana. They applied one hundred passes of each use-type on four sets of 12 trail segments, followed by simulated rainfalls and collection of water runoff to assess sediment yield at the base of each segment. Control sites that received no passes were also assessed for comparison. Results indicated that horses made significantly more sediment available for erosion than the other uses, which did not significantly vary from the control sites. Traffic on pre-wetted soils generated significantly greater amounts of soil runoff than on dry soils for all uses.

Marion (2006) studied 78 miles (125 km) of trail (47 segments) in the Big South Fork National River and Recreation Area, Tennessee and Kentucky, measuring soil loss along transects across the trail to evaluate the influence of use-related, environmental, and management factors.

Sidehill-aligned trails were significantly less eroded than trails in valley bottom positions, in part due to the influence of periodic floods. Trail grade and trail alignment angle were also significant predictors of tread erosion. Erosion rates on trails with 0-6 percent and 7-15 percent grades were similar, while erosion on trails with grades greater than 16 percent were significantly higher. And there was significantly greater erosion on fall line trails (alignment angles of 0-22 degrees) than those with alignments closer to the contour.

This study also provided an opportunity to examine the relative contribution of different use types, including horse, hiking, mountain biking, and ATV. Trails predominantly used for mountain biking had the least erosion of the use types investigated. Trails receiving equestrian use had significantly less erosion when rock content was high and grades were minimized.

Cessford (1995) provides a comprehensive, though dated, summary of trail impacts with a focus on mountain biking. Of particular interest is his summary of the two types of forces exerted by bike tires on soil surfaces: The downward compaction force from the weight of the rider and bike, and the rotational shearing force from the turning rear wheel. Mountain bikers generate the greatest torque, with potential tread abrasion due to slippage, during uphill travel. However, the torque possible from muscle power is far less than that from a motorcycle, so wheel slippage and abrasion occur only on wet or loose surfaces. Tread impact associated with downhill travel is generally minimal due to the lack of torque and lower ground pressures. Exceptions include when riders brake hard enough to cause skidding, which displaces soil downslope, or bank at higher speeds around turns, which displaces soil to the outside of the turn. Impacts in flatter terrain are also generally minimal, except when soils are wet or uncompacted and rutting occurs.

Impacts to Soils: Management Implications

Soil loss is among the most enduring forms of trail impact, and minimizing erosion and muddiness are the most important objectives for achieving a sustainable trail. Soil cannot easily be replaced on trails, and where soil disappears, it leaves ruts that make travel and water drainage more difficult, prompting further impacts, such as trail widening.

Existing studies indicate that motorized and equestrian use have far greater impacts to soils than human powered recreation. Other factors, particularly trail grade, trail/slope alignment angle, soil type/wetness, and trail maintenance, are more influential determinants of tread erosion or wetness.

There are a number of tactics for avoiding the worst soil-related impacts to trails:

- Discourage or prohibit off-trail travel. Informal trails created by off-trail travel frequently have steep grades and fall-line alignments that quickly erode, particularly in the absence of tread maintenance. Exceptions include areas of solid rock or non-vegetated cobble.
- Design trails with sustainable grades and avoid fall-line alignments. Where equestrian or motorized use is allowed, minimize trail grades and import rock material to form a durable substrate should the native soils not have substaintial rock content.

- When possible, build trails in dry, cohesive soils that easily compact and contain a larger percentage of coarse material or rocks. These soils better resist erosion by wind and water or displacement by feet, hooves and tires.
- Minimize tread muddiness by avoiding flat terrain, wet soils, and drainage-bottom locations.
- Use grade reversals to remove water from trail treads. Grade reversals are permanent and sustainable - when designed into a trail's alignment they remain 100 percent effective and rarely require maintenance.

Other strategies are more temporary in nature and will require periodic maintenance to keep them effective:

- While the use of a substantial outslope (e.g., 5 percent) helps remove water from treads, it is rarely a long-term solution. Tread cupping and berm development will generally occur within a few years after tread construction. If it is not possible to install additional grade reversals, reshape the tread to reestablish an outsloped tread surface periodically, and install wheel-friendly drainage dips or other drainage structures to help water flow off the trail.
- If it is not possible to install proper drainage on a trail, consider rerouting trail sections that are most problematic, or possibly hardening the tread with the addition of local or imported material (rocks).
- In flatter areas, elevate and crown treads to prevent muddiness, or add a gravel/soil mixture in low spots.
- Finally, it is important to realize that visitor use of any type on trails when soils are wet contributes substantially greater soil impact than the same activities when soils are dry. Thus, discouraging or prohibiting the use of trails that are prone to muddiness during rainy seasons or snowmelt is another effective measure. Generally such use can be redirected to trails that have design or environmental attributes that allow them to better sustain wet season uses.

For further reading see: Pickering et al 2010, Cessford 1995, Thurston and Reader 2001, Newsome et al 2004.

Impacts to Water Resources: General Research

Trails and their use can also affect water quality. Trail-related impacts to water resources can include the introduction of soils, nutrients, and pathogenic organisms (e.g., Giardia), and alter the patterns of surface water drainage. However, in practice, these impacts are avoidable, and properly designed and maintained trails should not degrade water quality. Unfortunately there is very little research to draw from on these topics, and none that is specific to different modes of trail use.

Poorly sited and/or maintained trails can be eroded by water, with tread sediments carried off by runoff. Generally, if water control features such as grade reversals and outsloped treads are used to divert runoff from trails, the water drops its sediment close to trails, where it is trapped and held by organic litter and vegetation. Soils eroded from trails rarely enter water bodies, unless trails cross streams or run close to stream or lake shorelines and lack adequate tread drainage features. Since many recreational activities, such as fishing, swimming, boating, and viewing scenery (e.g., waterfalls) draw visitors and trails to the vicinity of water resources, it is often necessary to route trails to water resources or visitors will simply create their own informal trails.

Trails that are close to water resources require special consideration in their design and management to prevent the introduction of suspended sediments into bodies of water. Eroded soil that enters water bodies increase water turbidity and cause sedimentation that can affect aquatic organisms (Fritz and others 1993). Trout and other fish lay their eggs in gravels on the bottom of streams and lakes, and sediments can smother those eggs, reducing reproductive success. Sedimentation can also hurt invertebrate organisms, which serve as food for fish and other creatures. In addition, some sediment may contain nutrients that can contribute to algal blooms that deplete the dissolved oxygen in water bodies when they die off.

Poorly designed trails can also alter hydrologic functions - for instance, trails can intercept and divert water from seeps or springs, which serve important ecological functions. In those situations, water can flow along the tread, leading to muddiness or erosion and, in the case of cupped and eroded treads, the water may flow some distance before it is diverted off the trail, changing the ecology of small wetland or riparian areas.

Trail users may also pollute water with pathogenic organisms, particularly those related to improperly disposed human waste. Potential pathogenic organisms found through surveys of backcountry water sources include Cryptosporidium spp., Giardia spp., and Campylobacter jejuni (LeChevallier and others, 1999; Suk and others, 1987; Taylor and others, 1983). This is rarely a significant concern where trail use is predominantly day-oriented, and waste issues can be avoided by installing toilet facilities or following Leave No Trace practices (i.e., digging cat-holes for waste away from water resources).

Impacts to Water Resources: Management Implications

The same trail design, construction, and maintenance measures that help minimize vegetation and soil impacts also apply to water. But there are also some additional efforts needed to protect water resources:

- Trails should avoid close proximity to water resources. For example, it is better to build a trail on a sidehill along a lower valley wall than to align it through flat terrain along a stream edge, where trail runoff will drain directly into the stream.
- It is best to minimize the number of stream crossings. Where crossings are necessary, scout the stream carefully to select the most resistant location for the crossing. Look for rocky banks and soils that provide durable surfaces.
- Design water crossings so the trail descends into and climbs out of the steam crossing, preventing stream water from flowing down the trail.
- Armor trails at stream crossings with rock, gravel or concrete to prevent erosion.
- Include grade reversals, regularly maintained outsloped treads, and/or drainage features to divert water off the trail near stream crossings. This prevents water and sediment from flowing down the trail into the stream, and allows trailside organic litter, vegetation, and soils to slow and filter water.
- On some heavily used trails, a bridge may be needed to provide a sustainable crossing.
- Where permanent or intermittent stream channels cross trails, use armoring, open rock culverts or properly sized buried drainage culverts to allow water to cross properly, without flowing down the trail.

Impacts to Wildlife: General Research

Trails and trail users can also affect wildlife. Trails may degrade or fragment wildlife habitat, and can also alter the activities of nearby animals, causing avoidance behavior in some and food-related attraction behavior in others (Hellmund, 1998; Knight & Cole, 1991). While most forms of trail impact are limited to a narrow trail corridor, disturbance of wildlife can extend considerably further into natural landscapes (Kasworm & Monley, 1990; Tyser & Worley, 1992). Even very localized disturbance can harm rare or endangered species.

Different animals respond differently to the presence of trail users. Most wildlife species readily adapt or become "habituated" to consistent and non-threatening recreational activities. For example, animals may notice but not move away from humans on a frequently used trail. This is fortunate, as it can allow high quality wildlife viewing experiences for visitors and cause little or no impact to wildlife.

Other forms of habituation, however, are less desirable. Visitors who feed wildlife, intentionally or from dropped food, can contribute to the development of food-related attraction behavior that

can turn wild animals and birds into beggars. In places where visitors stop to eat snacks or lunches, wildlife quickly learn to associate people with food, losing their innate fear of humans and returning frequently to beg, search for food scraps, or even raid unprotected packs containing food. Feeding wild creatures also endangers their health and well-being. For instance, after food-attracted deer in Grand Canyon National Park became sickly and dangerously aggressive, researchers found up to six pounds of plastic and foil wrappers obstructing intestinal passages of some individuals.

The opposite conduct in wildlife - avoidance behavior - can be equally problematic. Avoidance behavior is generally an innate response that is magnified by visitor behaviors perceived as threatening, such as loud sounds, off-trail travel, travel in the direction of wildlife, and sudden movements. When animals flee from disturbance by trail users, they often expend precious energy, which is particularly dangerous for them in winter months when food is scarce. When animals move away from a disturbance, they leave preferred or prime habitat and move, either permanently or temporarily, to secondary habitat that may not meet their needs for food, water, or cover. Visitors and land managers, however, are often unaware of such impacts, because animals often flee before humans are aware of the presence of wildlife.

Two studies of possible interest are summarized below:
A study of the Boise River in Idaho examined flushing distances of bald eagles when exposed to actual and simulated walkers, joggers, fishermen, bicyclists, and vehicles (Spahr 1990). The highest frequency of eagle flushing was associated with walkers (46 percent), followed by fishermen (34 percent), bicyclists (15 percent), joggers (13 percent), and vehicles (6 percent). However, bicyclists caused eagles to flush at the greatest distances (mean = 148 meters), followed by vehicles (107m), walkers (87m), fishermen (64m), and joggers (50m). Eagles were most likely to flush when recreationists approached slowly or stopped to observe them, and were less alarmed when bicyclists or vehicles passed quickly at constant speeds. Similar findings have been reported by other authors, who attribute the difference in flushing frequency between walkers and bikers/vehicles either to the shorter time of disturbance and/or the additional time an eagle has to "decide" to fly (Van der Zande and others. 1984).

Impacts to Wildlife: Management Implications

- Many potential impacts to wildlife can be avoided by ensuring that trails avoid the most sensitive or critical wildlife habitats, including those of rare and non-rare species. There are a number of tactics for doing this:
- Route trails to avoid riparian or wetland areas, particularly in environments where they are uncommon. Consult with fish and wildlife specialists early in the trail planning phase.
- For existing trails, consider discouraging or restricting access during sensitive times/ seasons (e.g., mating or birthing seasons) to protect wildlife from undue stress.
- The education of trail users is also an important and potentially highly effective management option for protecting wildlife. Organizations should encourage Leave No Trace practices and teach appropriate behaviors in areas where wildlife are found:

- Store food safely and leave no crumbs behind - fed animals too often become dead animals.
- It's OK for wildlife to notice you but you are "too close" or "too loud" if an animal stops what it's doing and/or moves away from you.
- It's best to view wildlife through binoculars, spotting scopes, and telephoto lenses.
- All wildlife can be dangerous - be aware of the possible presence of animals and keep your distance to ensure your safety and theirs.

Conclusion

Scientific studies have examined the impacts of recreational use on trails and public lands. These studies provide an objective lens to view and understand how to better manage recreational use while minimizing impacts to natural resources and other users. The body of research has shown that motorized and equestrian use have significantly greater impacts to the natural resources than human powered trail uses. Studies present data that suggest ways to minimize impacts associated with trails, through proper design and construction (shallower grades, frequent grade reversals or water control features, more durable substrates with higher rock content).

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Appendix E: Recommended Trail Development Resources

Conflicts on Multiple-Use Trails. Roger Moore. U.S. Federal Highway Administration, 1994. www.fs.fed.us/cdt/carrying_capacity/conflicts_trails_synthesis_1994.pdf
This resource offers a comprehensive review of the research literature related to recreation conflict, and has served as an invaluable resource for trail managers, volunteers, and advocates for more than a decade. The information summarized in Section 2.5 is built upon the foundation of knowledge presented in this free publication.

Fromme Mountain Sustainable Trail Use and Classification Plan. District of North Vancouver, 2008 (http://www.dnv.org/article.asp?c=988)
This document is a good example of system-wide trail master plan. It was created through a 5-year process, and formalizes a shared-vision for the trails on Fromme Mountain. The document includes assessment of each system trail to provide an overall vision, best practices for environmental sustainability, and provides trail guidelines for future trail projects.

Lightly on the Land: The Student Conservation Association Trail-Building and Maintenance Manual. Robert Birkby, SCA, 2005 (*www.imba.com*)
Lightly on the Land focuses on crew leadership and the nuts and bolts of trail construction and maintenance. It contains detailed instructions on many technical skills such as building with rock, felling and buckling, building with timber, bridge construction, transplanting, and environmental restoration. It gets down and dirty with tools, tool repair, knots, and rigging. Instead of photos, it uses hundreds of fine illustrations to depict specialized techniques such as surveying, rigging, stonework, chainsaw skills, timber joinery, and bridge building.

Managing Mountain Biking: IMBA's Guide to Providing Great Riding. IMBA, 2007 (*www.imba.com*)
Managing Mountain Biking offers a collection of best practices for planning, designing, and managing successful trail networks and bike parks. More than 50 experts—including land managers, recreation ecologists, professional trailbuilders, and experienced advocates—contributed to Managing Mountain Biking, creating a complete reference. Managing Mountain Biking details overcoming user conflict, minimizing environmental impact, managing risk, and providing technically challenging riding. While Trail Solutions covers trail construction, Managing Mountain Biking focuses on solving mountain biking issues through innovative trail design, effective partnerships, and visitor management strategies.

Natural Surface Trails by Design: Physical and Human Design Essentials of Sustainable, Enjoyable Trails. Troy Scott Parker, 2007 (*www.imba.com*)
This groundbreaking book explores trail design from a theoretical perspective, covering the physical and human forces and relationships that govern trails—how we perceive nature, how trails make us feel, how trail use changes trails, and how soils, trail materials, water, drainage, and erosion behave.

Recreational Trail Study for British Columbia: Phase 1 – Background Report. Ministry of Tourism, Sports and the Arts, Ministry of Environment, and Province of British Columbia, 2007

www.tsa.gov.bc.ca/sites_trails/docs/Provincial_Trails_Strategy/Trail_Strategy_Appendix1_May23.pdf
The first phase of this multi-phased project is the creation of this background report. This document is a great reference for information on Canadian laws and rules related to trails, best trail management practices from across North America, and discussion on the overall benefits of trails. It also includes a comprehensive survey, and the results, to help create a vision for the provincial trail planning, potential funding sources, and a province-wide trail inventory.

Region 5 Mountain Bike Management Strategy: Situational Assessment and Implementation Toolbox. Garrett Villanueva. U.S. Forest Service, 2007.
http://www.fs.fed.us/r5/mountainbikes/
This management strategy and situational assessment characterizes existing mountain bike trail conditions and provides methods for management. This document is written specifically for Region 5 in California, but its format, as a toolbox provides trail management advice that can be applied in any trail system. It is also a good example of a system-wide master plan.

Sea to Sky Corridor Recreation Trail Strategy. British Columbia, Ministry of Tourism, Sport and the Arts, 2007 (http://www.tsa.gov.bc.ca/sites_trails/Initiatives/SeatoSky-Strategy/sea_to_sky_strategy.htm)
The Ministry of Tourism, Culture and the Arts (MTCA) developed this comprehensive strategy to provide guidance on the management of this regional trail system. The strategy provides a framework for legal authorization and establishment of the vast majority of previously unauthorized trails on Crown land, recommends a process and organizational structure for ensuring a Corridor-wide coordinated approach to management of the extensive trail network, identifies opportunities and actions required to ensure a sustainable and economically beneficial network, and outlines and recommends trail construction, maintenance and sign standards and guidelines. This document is a useful example of a regional trail masterplan.

Trail Construction and Maintenance Notebook. Woody Hesselbarth, Brian Vachowski, and Mary Ann Davies. U.S. Forest Service, 2007 (www.fhwa.dot.gov/environment/rectrails/trailpub.htm)
This pocket-sized notebook is oriented to the needs of a trailworker. It pulls together basic trail construction and maintenance information in an easy-to-understand format. It includes a lot of the information detailed in Trail Solutions, plus a few additional strategies for trails in wet areas. It is concise with lots of illustrations – a perfect book to keep in a backpack out on the trail.

Trail Planning, Design, and Development Guidelines. Minnesota Department of Natural Resources, Trails and Waterways Division, 2007 (www.comm.media.state.mn.us/bookstore)
This comprehensive guide to shared-use paved trails, natural surface trails, winter use trails and bikeways is an excellent reference, well organized with tabs and an easy to follow lay-out. The book features dozens of useful reference illustrations and pictures for each specific topic (i.e. 6 pictures of different types of water caused erosion). Some information is Minnesota specific, but most is relevant to all climates and situations.

Trail Solutions: IMBA's Guide to Building Sweet Singletrack. IMBA, 2004 (*www.imba.com*)
This comprehensive trailbuilding resource combines cutting-edge trailbuilding techniques with proven fundamentals in an easy-to-read format. The book is divided into eight sections that follow the trailbuilding process from beginning to end. Readers will be guided through the essential steps of trail planning, design, tool selection, construction, and maintenance. Additionally, Trail Solutions provides detailed advice on banked turns, rock armouring, mechanized tools, freeriding, downhilling, risk management, and other pioneering techniques. Trail Solutions is an essential tool for land managers and volunteer trailbuilders aspiring to raise their shared-use trail systems to the next level.

Wetland Trail Design and Construction. U.S. Forest Service, 2007. www.fhwa.dot.gov/environment/fspubs.
This manual describes common techniques for building a wetland trail. Starting with identifying the type of wetlands, this manual outlines how to build a dozen different types of wetland crossing structures (with and without foundations), what tools and materials to use, and instruction on maintaining drainage to minimize environmental impacts. This book is written for wetland trails, the techniques described can also be used for correcting other poorly drained low areas in existing trails.

Appendix F: Memorandum Of Understanding USFS and Backcountry Horsemen of America

SERVICE-WIDE MEMORANDUM OF UNDERSTANDING
07-SU-11132424-002
between
THE UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE
and
THE BACK COUNTRY HORSEMEN OF AMERICA

This memorandum of understanding (MOU) is entered into by the United States Department of Agriculture, Forest Service (FS) and the Back Country Horsemen of America (BCHA).

A. PURPOSE
The purpose of this MOU is to continue to develop and expand a framework for the FS and BCHA to plan and implement mutually beneficial programs, projects, training, and other equestrian opportunities at the national, regional and local levels.

B. AUTHORITY
The authority of this MOU is the Organic Act of 1897, 16 U.S.C. § 551.

C. STATEMENT OF MUTUAL BENEFIT AND INTERESTS
The FS manages National Forest System (NFS) lands for a variety of users and activities, including outdoor recreation. The FS is interested in providing a variety of equestrian opportunities that are environmentally sensitive and educational and that support local and regional economies and quality of life.

BCHA is a national organization of private recreational saddle and pack stock users and is a recognized leader in establishing equestrian and saddle and pack stock ethics, providing education on responsible backcountry use, encouraging volunteerism, and fostering appropriate management of federal and non-federal lands. BCHA members desire to use the National Forests for recreational purposes and to accomplish mutually beneficial equestrian and recreational saddle and stock projects or activities.
The parties want to encourage responsible use of NFS lands by visitors participating in equestrian and recreational stock travel and activities. Both the FS and BCHA disseminate information to the public regarding conversation, recreation, and natural resource activities as they relate to equestrian and recreational stock use.

D. THE FS AGREES TO:
1. Work with BCHA to facilitate improved understanding and communication among equestrian and recreational stock users, federal agencies, and the public.
2. Work with BCHA and its affiliates to identify appropriate cooperative opportunities,

such as trail projects, administrative studies, and educational programs, and, contingent upon availability of funds and personnel, pursue these projects and activities jointly with the equestrian and recreational stock community.
3. Encourage local FS officials to collaborate with BCHA national office staff, representatives, affiliates, and members in the development of mutually beneficial projects and educational activities.
4. Where appropriate and feasible, make available to the public information form BCHA regarding development and presentation of training materials related to responsible equestrian and recreational stock use on NFS lands.
5. Consistent with applicable laws, regulations, land management plans, other management direction, and the FS's multiple-use mission, facilitate the continued access and use of NFS lands for equestrian and recreational stock use and related activities.
6. Consistent with applicable laws, regulations, and FS policies, consider BCHA's goals and concerns in trail system analysis and planning, and in particular, in developing and managing FS programs relating to equestrian and recreational stock use.
7. Provide information on completing job hazard analyses and conducting safety training for BCHA project sand activities conducted on NFS lands pursuant to this MOU.

E. BCHA AGREES TO:

1. Work with the FS to facilitate improved understanding and communication among equestrian and recreational stock users, federal agencies, and the public.
2. Work with the FS to identify appropriate cooperative opportunities, such as trail projects, administrative studies, and educational programs, and to pursue these projects jointly.
3. Develop and maintain a communication network for contacting equestrian and recreational stock users through a system of local and state BCHA facilities.
4. Subject to applicable federal laws, regulations, land management plans, and other management direction, provide input on trail system analysis and planning and assistance to land managers and communities involved in equestrian and recreational stock projects, educational activities, and management.
5. Maintain a public database and library of publications related to BCHA activities.
6. Provide training and instruction to its members and, when appropriate, the public regarding Leave No Trace and other this programs relating to backcountry equestrian and recreational stock use, and encourage the incorporation of these programs in that use.
7. Obtain FS approval prior to publication of any materials regarding equestrian and recreational stock use on NFS lands that are developed cooperatively by the FS and BCHA and that are intended for public distribution.
8. Complete job hazard analyses for BCHA projects and activities conducted on NFS lands pursuant to this MOU, and conduct safety training prior to engaging in these projects and activities. Address anticipated hazards and steps that should be taken to

reduce the hazards in these training sessions.

F. IT IS MUTUALLY AGREED BY THE FS AND BCHA THAT:

1. This MOU shall take effect when it is fully executed and shall expire five years from its effective date.
2. Modifications to this MOU shall be made in writing and shall be signed and dated by the FS and BCHA.
3. Either the FS or BCHA may withdraw from this MOU after 60 days written notice.
4. The principle contacts for this MOU are:

Jonathan Stephens
Congressionally Designated Areas and Trails Program Manager
USDA Forest Service
Recreation and Heritage Resources Staff
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Facsimile: (360) 832-2471
Email: athill01@Charter.net

The FS and BCHA certify that the individuals listed as principal contacts are authorized to act in their respective areas of responsibility on matters related to this MOU. The local contacts for the FS are District Rangers, who may enter in subsequent agreements as needed to implement this MOU.

5. The FS and BCHA will handle their own activities and utilize their own resources, including expenditure of their own funds, in pursuing the objectives enumerated in this MOU.
6. In implementing this MOU, the FS will be operating under applicable laws, regulations, and policies, subject to the availability of appropriated funds.
7. Nothing in this MOU authorizes the FS to obligate or transfer funds. Specific projects or activities that involve the transfer of funds, or property between the FS and BCHA require executive of separate agreements and are contingent upon the availability of appropriated funds. These activities must be independently authorized by statute. This MOU does not provide that authority. Negotiation, executive, and

administration of these agreements must comply with all applicable law. Nothing in this MOU is intended to alter, limit, or expand the FS's statutory and regulatory authority.

Nothing in this MOU restrict the FS or BCHA from participating in similar activities with other public or private agencies, organizations, and individuals.

This MOU does not create any substantive or procedural rights that are enforceable at law or equity against the United States or its officers, agents, or employees.

Any information furnished to the FS under this MOU is subject to the Freedom of Information Act (5 U.S.C. § 552).

No member of or delegate to Congress may benefit from this MOU either directly or indirectly.

(Signature)_____ Date: 11/29/06
Merlyn Huso, Chairman
BACK COUNTRY HORSEMEN OF AMERICA

(Signature)_____ Date: 12/13/06
Dale N. Bosworth
Chief
USDA, FOREST SERVICE

Appendix G: Memorandum Of Understanding USFS and International Mountain Bicycling Association

SERVICE-WIDE MEMORANDUM OF UNDERSTANDING
06-SU-11132424-076
between
THE UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE
and
THE INTERNATIONAL MOUNTAIN BICYCLING ASSOCIATION

This memorandum of understanding (MOU) is entered into by the United States Department of Agriculture, Forest Service (FS), and the International Mountain Bicycling Association (IMBA).

A. PURPOSE
The purpose of this MOU is to continue to develop and expand a framework for the FS and IMBA to plan and implement mutually beneficial programs, projects, and bicycling opportunities at the national, regional, and local level.

B. AUTHORITY
The authority for this MOU is the Organic Act of 1897, 16 U.S.C. § 551.

C. STATEMENT OF MUTUAL BENEFIT AND INTERESTS
The FS manages National Forest System (NFS) lands for a variety of uses and activities, including outdoor recreation. The FS is interested in providing a variety of mountain bicycling opportunities that are environmentally sensitive and educational that support local and regional economies and quality of life.

IMBA represents a major segment of the organized mountain bicycling public and is a recognized leader in trailbuilding education and promoting mountain bicycling ethics, safety standards, volunteerism, and appropriate use of federal and non-federal lands. IMBA members desire to use National Forests for recreational purposes and through this MOU or subsequent agreements may provide support, volunteer labor, or funds to the FS for accomplishment of mutually beneficial mountain bicycling projects or activities.

The FS and IMBA seek to work cooperatively to encourage responsible use of federal lands by visitors participating in mountain bicycling and recreational activities. The FS and IMBA have an interest in disseminating information to the public regarding conservation, recreation, and natural resource activities related to mountain bicycling.

D. THE FS SHALL:
1. Work with IMBA and its affiliates to identify appropriate cooperative opportunities (such as trail projects, administrative studies, educational programs, tourism initiatives, and special

events). Contingent upon availability of funds and personnel, jointly pursue these projects in conjunction with the mountain bicycling community and FS Ranger Districts nationwide.
2. Make available to the public IMBA's training and informational materials related to mountain bicycling safety and ethics, trail construction and maintenance, and the availability of mountain bicycling opportunities on NFS lands.
3. Encourage local FS officials to work with IMBA headquarters staff, representatives, affiliates, and members to develop mutually beneficial projects, special events, and activities.
4. Subject to applicable federal laws, regulations, land management plans, and other management direction, make NFS lands and NFS trails available for mountain bicycling and related activities.
5. Encourage management of mountain bicycling separate from motorized activities when developing agency policy, land management plans, and travel management plans.
6. Utilize the technical expertise of IMBA and its affiliates in developing FS educational programs related to mountain bicycling.
7. Utilize IMBA's technical expertise to address mountain bicycling management on NFS lands, including but not limited to such documents as the Recreation Opportunity Spectrum and the FS Handbook. (NOTE: Mountain bike use is not excluded from areas inventoried as "primitive" in the ROS.)
8. Provide copies of IMBA's "Rules of the Trail" at FS information centers, trailheads, campgrounds, and other appropriate public sites on NFS lands.
9. Share with IMBA technical expertise with respect to mountain bicycling management on NFS lands.
10. Consider the potential impacts of land management proposals on mountain bicycling recreation.
11. Within the budget and resource capabilities of local FS staff, participate in projects that develop mountain bicycling opportunities on NFS lands.
12. Work with IMBA and local FS staff to identify opportunities and areas for specialized mountain bicycling in accordance with special use permit requirements and other applicable legal requirements. Identify opportunities to promote the public health and fitness benefits of mountain bicycling.
13. Provide information on completing job hazard analyses and conducting safety training for IMBA projects and activities conducted on NFS lands pursuant to this MOU.

E. IMBA SHALL:

1. Work with the FS to identify appropriate cooperative opportunities (such as trail projects, administrative studies, educational programs, tourism initiatives, and special events). Contingent upon availability of funds and personnel, jointly pursue these projects in conjunction with the mountain bicycling community and FS Ranger Districts nationwide.
2. Provide information compiled in IMBA programs, such as the IMBA Trail Care Crew, trailbuilding schools, Trail Solutions trailbuilding services, IMBA Epic Rides, and the National Mountain Bike Patrol program, available to the FS at no cost.
3. Encourage IMBA members and affiliates to work with local FS officials to develop mutually beneficial projects, special events, and activities.

4. Provide technical assistance to FS managers and communities involved in developing and implementing projects, educational activities, and mountain bicycling opportunities pursuant to this MOU.
5. Encourage IMBA members to participate in local national forest planning that involves mountain bicycling or recreation.
6. Provide training to IMBA members regarding the Rules of the Trail, Leave No Trace, and Tread Lightly! ethics programs.
7. Work with FS staff to ensure that written materials and other media produced for National Forest distribution are consistent with FS policies and guidelines.
8. Participate in projects that develop mountain bicycling opportunities on NFS lands.
9. When operators of ski areas on NFS lands allow summer mountain bicycling on their trails, work with those ski areas to implement IMBA's Rules of the Trail, trailbuilding and signage guidelines, and management principles.
10. Encourage IMBA members to respect wilderness areas; comply with wilderness laws, regulations, and policies; and abide by outdoor ethics principles, including Leave No Trace and Tread Lightly!, on NFS lands.
11. Work with local FS staff to identify opportunities and areas for specialized mountain bicycling in accordance with special use permit requirements and other applicable legal requirements. Identify opportunities to promote the public health and fitness benefits of mountain bicycling.
12. Complete job hazard analyses for IMBA projects and activities conducted on NFS lands pursuant to this MOU, and conduct safety training prior to engaging in these projects and activities. Address anticipated hazards and steps that should be taken to reduce the hazards in these training sessions.

F. IT IS MUTUALLY AGREED BY THE FS AND IMBA THAT:

1. This MOU shall take effect when it is fully executed and shall expire five years from its effective date.
2. Modifications to this MOU shall be made in writing and shall be signed and dated by the the FS and IMBA.
3. Either the FS or IMBA may withdraw from this MOU after 60 days written notice.
4. The principal contacts for this MOU are:

Jonathan Stephens, Congressionally
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Recreation and Heritgage Resources
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Mike Van Abel, Executive Director
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The FS and IMBA certify that the individuals listed as principal contacts are authorized to act in their respective areas of responsibility on matters related to this MOU. The local contacts for the FS are District Rangers, who may enter into subsequent agreements as needed to implement this MOU.

5. The FS and IMBA shall handle their own activities and utilize their own resources, including the expenditure of their own funds, in pursuing the objectives enumerated in this MOU.
6. In implementing this MOU, the FS will be operating under applicable laws, regulations, and policies, subject to the availability of appropriated funds.
7. Nothing in this MOU authorizes the FS to obligate or transfer funds. Specific projects or activities that involve the transfer of funds, services, or property between the FS and IMBA require execution of separate agreements and are contingent upon the availability of appropriated funds. These activities must be independently authorized by statute. This MOU does not provide that authority. Negotiation, execution, and administration of these agreements must comply with all applicable law.
8. Nothing in this MOU is intended to alter, limit, or expand the FS's statutory and regulatory authority.
9. Nothing in this MOU restricts the FS or IMBA from participating in similar activities with other public or private agencies, organizations, and individuals.
10. This MOU does not create any substantive or procedural rights that are enforceable at law or equity against the United States or its officers, agents, or employees.
11. Any information furnished to the FS under this MOU is subject to the Freedom of Information Act (5 U.S.C. § 552).
12. No member of or delegate to Congress may benefit from this MOU either directly or indirectly.

Mike Van Abel
Executive Director
INTERNATIONAL MOUNTAIN BICYCLING ASSOCIATION

Dale N. Bosworth
Chief USDA, FOREST SERVICE

Appendix H: Chattahoochee-Oconee National Forest Recreation Supply And Demand

Demands for trail-based recreation in the Chattahoochee-Oconee National Forest have grown dramatically in the last thirty years. Much of this is due population increases. From 1980 to 2011 (US Census) County populations in the Chattahoochee National Forest have increased from 372,000 to 582,000 from 1980 to 2011 and in the Oconee from 60,000 to 104,000. During the same period, the Georgia population increased from 5.46 Million to 9.82 Million and the 28-County Metropolitan Atlanta area currently has a population of 5.48 Million people (Atlanta Convention and Visitors Bureau).

The increase of approximately 250,000 (58% increase) residents living in Georgia Counties with a National Forest would reasonably increase the demand for trail-based recreation. However, with the 2011 Atlanta metropolitan population as large as the 1980 State of Georgia population, this metropolitan sector is likely the biggest current and future driver of recreational demand in the Forest. While data across this broad geographic area regarding in-state and out-of-state vacation visitation, second home development, and non-resident economic impacts are difficult to calculate, the nature of retail establishments and the density of newer homes around area reservoirs attest to the high level of tourism. With limited manufacturing and timber-related industries in the area, it is reasonable to assume that tourism will continue to be a major economic engine in Georgia. And as the National Forest is the major land owner/manager in the region, offering land and water-related recreation opportunities, demands will likely continue to increase for more and better recreation.

Table 1. Population Change in Chattahoochee National Forest Counties- 1980 to 2011 (US Census Bureau, figures rounded nearest 1,000 residents)

County	1980 Population	2011 Population	Growth
Banks	9	18	9
Catoosa	37	64	27
Chattooga	22	26	4
Fannin	14	23	9
Floyd	80	96	16
Gilmer	11	28	17
Gordon	30	55	25
Habersham	25	43	18
Lumpkin	11	30	19
Murray	20	40	20

County	1980 Population	2011 Population	Growth
Rabun	10	16	6
Stephens	22	26	4
Towns	6	11	5
Union	9	21	12
Walker	56	68	12
White	10	27	17
Totals:	**372**	**582**	**220**

Table 2. Population Change in Oconee National Forest Counties- 1980 to 2011 (US Census Bureau), figures rounded nearest 1,000 residents

County	1980 Population	2011 Population	Growth
Butts	14	24	10
Greene	11	16	5
Jasper	8	14	6
Jones	17	29	12
Putnam	10	21	11
Totals	**60**	**104**	**44**

The trail-based activities being sought in the National Forest have also changed dramatically in the last 30 years. In 1980, the majority of trail recreation was undertaken by individuals that were comfortable in backcountry situations- hikers, anglers, and equestrians that were prepared for extended-duration activities. These types of forest visitors often used, but did not necessarily need, trails. These avid backcountry users were and still are able to navigate by map and compass or have an inherent knowledge of the landscape they explore. While the total numbers of individuals seeking and prepared for these experiences has likely increased over the last thirty years, it has been an increase that more closely resembles the population growth in the Forest Counties- relatively large, but manageable. The Forest's current system of trails, with a focus on backcountry

and Wilderness experiences, can still meet this need, so long as improvements in physical sustainability are implemented.

The growth of new trail-based activities and participation in these activities is more akin to the growth in the Atlanta metropolitan population. In the last 30 years, a number of changes have taken place that altered participation in trail-based activities, including the:

- Improvements in footwear and clothing that have greatly improved break-in time, waterproofing, and breatheability;
- Growth of trail running, opening up trails to millions of runners and joggers;
- Development of the modern mountain bike that could withstand the rigors of trail riding;
- Affordable, easy-to-operate off-highway vehicles such as ATV's and side-by-sides;
- Technology such as hand-held global positioning units and hydration backpacks that make essential trail needs of navigation and sustenance much less difficult

All of these changes have made being in the outdoors a more enjoyable activity for a larger cross section of the population. This growth trend in outdoor activity participation has been recognized by many, including the Forest Service and Outdoor Industry Association. The National Survey of Recreation and the Environment (NSRE) Recreation and Tourism Statistics Update (Cordell, 2006) reported the following estimates of recreation participation in the US Forest Service Region 8 lands by residents 16 and older. Estimates for Georgia resident participation are calculated by multiplying the estimated participation percentage by the Georgia population of 9.82 million (US Census Bureau, 2009) with the assumption that use participation in Georgia is proportional to that in other states in Region 8 and nationally, respectively.

Table 3. NSRE Estimates of Region 8 Recreation Participation (rounded to the nearest 1,000)

Activity	Percentage of Population	Total Estimated Region 8 Participants	Estimated GA Participation
Freshwater Fishing	31.6	23,656,285	3,103,000
Day Hiking	28.8	21,569,639	2,828,000
Mountain Biking	17	12,744,658	1,669,000
Hunting	13	9,720,342	1,276,000
Horseback Riding (on trails)	8.6	6,440,979	844,000
Backpacking	8.2	6,128,472	805,000
Rock Climbing	4.1	3,069,574	402,000

The NSRE statistics provide larger participation estimates than are presented in other sources. The Outdoor Industry Association's latest National Outdoor Recreation Participation Study (OIA, 2010) provides the following estimates for Americans 6 years old and older.

Table 4. OIA Estimates of Recreation Participation (rounded to the nearest 1,000)

Activity	Percentage of Population	Total Estimated National Participants	Estimated GA Participation
Fly Fishing	1.9	5,478,000	187,000
Day Hiking	11.5	32,496,000	1,139,000
Mountain Biking	2.5	7,142,000	246,000
Hunting	4.9	14,007,000	530,000
Horseback Riding (on trails)	3.5	9,809,000	344,000
Backpacking	2.9	8,349,000	265,000
Trail Running	1.8	5,136,000	177,000
Rock Climbing	0.8	2,198,000	69,000

Figure 1: OIA Participation in Outdoor Activities by Demographic (2010)

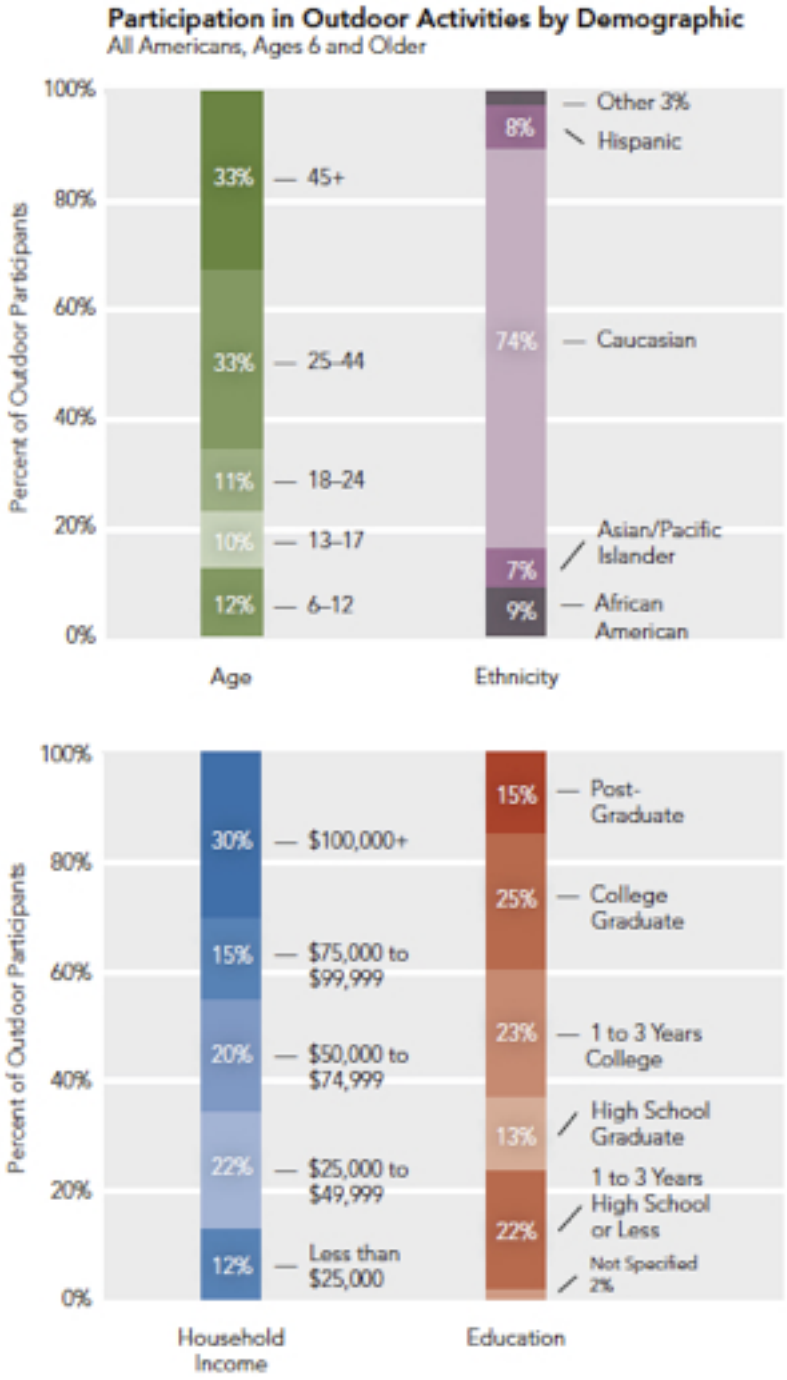
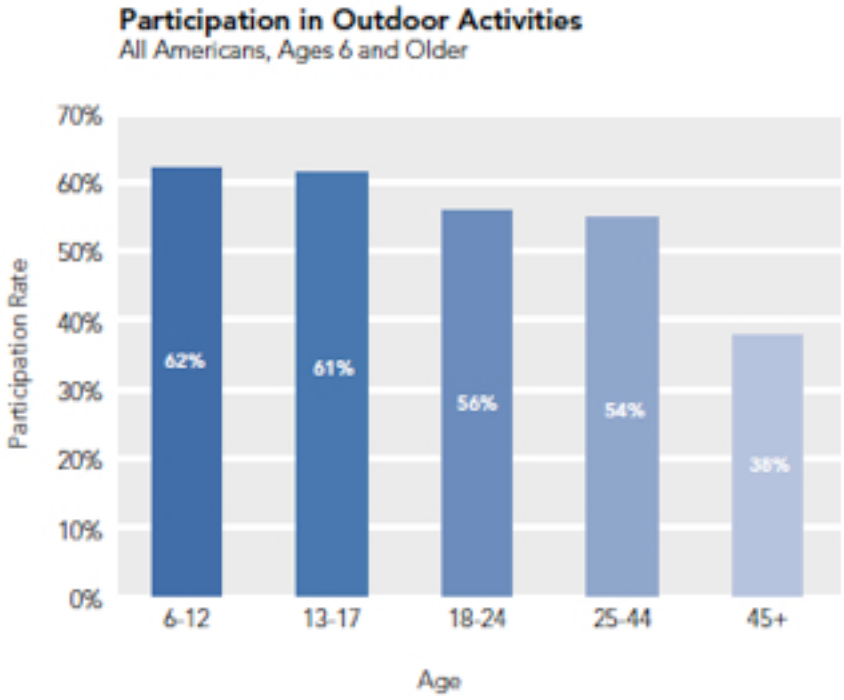


Figure 2: OIA Participation in Outdoor Activities by Age (2010)



The Southern Appalachian Assessment defines recreation supply as: "*the opportunity to participate in a desired recreation activity in a preferred setting to realize desired and expected experiences. Three components of supply are settings, activities, and facilities. These three components are linked in the following manner:*

1. Landscapes are available for people to use in recreational pursuits. Landscapes are characterized by settings, which provide the physical and social environments needed to produce experiences.

2. Recreationists choose a setting and activity to create a desired experience.

3. Facilities, such as campgrounds and trails, are supplied to assist uses of the setting and to support activities.

Settings, activities, and support facilities are managed to maintain the condition necessary to produce the expected experience. There are limits to the use of settings. When use is too intensive for recreators to achieve desired experiences, the carrying capacity has been exceeded. Providing additional support facilities may increase the capacity of settings."

The Chattachoochee-Oconee National Forest has incredible physical settings for trail-based activities, almost universally across the Forest. However, the social environments revolving around the Recreational Opportunity Spectrum (ROS) Classes and current managed uses do not align with the recreational growth of the last 30 years. The technology advancements that have made it easier for more people with fewer backcountry skills to get outside on trails have not been met with the relatively developed social settings in which this urban/ suburban demographic is most comfortable. By and large, this group is seeking easily navigable experiences such as loop trails and options that keep them outside for thirty minutes to three hours, with relatively easy to access trailheads.

Managed uses on the Chattahoochee-Oconee system of trails has also not met the changes in demand brought on by the past 30 years. The under-representation of mileage in allowed uses for mountain bike, equestrian, and off-highway vehicle use has resulted in recreationists from these groups seeking out suitable experiences on trails where they are not currently allowed. This use may cause resource damage if the trail is not constructed to withstand different stressors introduced by these modes of travel. It may create social concerns where allowed visitors have suffered unforeseen changes in their experiential expectations. However, concerns of these types, communicated mainly with restricted use stickers on trail signage, are not likely to be heeded when sufficient opportunities, by mileage and experiential value, are not provided.

The table above demonstrates that opportunities for non-hiking use in the Chattahoochee-Oconee are rather limited. This fact is magnified when consideration is given to average distance traversed per hour of recreation.

Table 5. Recreation Hours Provided in CONF by Allowed Use and Average Miles Traversed/Hour

Use	Avg. Miles Traversed/Hour	Allowed Miles	Recreation Hours Provided
Day Hiking	2 miles/hour	886	443
Horseback Riding	4 miles/hour	237	59
Mountain Biking	6 miles/hour	287	48

If allowed use were to be proportionate in relation to the estimated participation in various activities by available hours of recreation provided, then more than 500 miles of trails would be required to meet the demands of horseback riding and mountain biking in the Chattahoochee-Oconee. Without allowed mileage at that level, it can be assumed that mountain bike and equestrian use volumes will be much higher on trails where those uses are allowed and, subsequently, maintenance needs will also likely increase.

Table 6. Proportionate Use by Participation and Average Trail Miles Traversed/Hour

Use	Current Recreation Hours Provided	NSRE Relative Participation	Proportionate Mileage (NSRE)	OIA Relative Participation	Proportionate Miles (OIA)
Day Hiking	443	100%	443	100%	443
Horseback Riding	59	30%	532	30%	532
Mountain Biking	48	60%	1,594	22%	585

The discrepancy of recreation opportunities provided versus demand by Designed/Primary Use type is even greater. The table below demonstrates only 59 miles of trail in the Forest are designed for bike use. This is understandable in the context of mountain biking as a relatively new trail activity and very few alterations to the Forest system of trails or the allowed uses have transpired in the past thirty years. However, relative to participation/demand for the activity, the provision for this activity type is lagging greatly.

The table below splits out shared-use trails that include equestrian use. This information was derived from Designed Use information on the Forest's Trail Management Objective (TMO) sheets. Technically there cannot be more than one Designed Use for a trail. By definition, it must be designed for the use type with the greatest design needs. For non-motorized trails, pack and saddle use is determined to have the highest level of design need, followed by bicycling, then pedestrian uses. On the ground, across the horse-bike, horse-bike-hike trail included in the assessment, much of the trail mileage is being maintained as eight to twenty foot wide corridors, essentially roads, rather than with narrower three to six foot corridors as prescribed in the trail fundamentals. So, while this shared-use mileage is attributed as trail designed for a specific use, particularly in the case of equestrian and mountain bike use, it is defacto managed as road and not meeting the Forest Service design specifications for those uses or the expected and desired experiences of those users.

With the current challenges regarding the physical and managerial sustainability outlined earlier, a truly proportionate provision for recreation opportunities across the current spectrum of use will be quite difficult. However, incremental improvements are possible via three methods, including:

- Addition of new trails for under-served uses in locations compatible with LRMP and ROS classes
- Retrofit of existing trails to facilitate an expansion of managed uses in a sustainable manner where those uses are compatible with LRMP goals and ROS classes
- Closure of trails that receive little use or have little probability of attaining a sustainable managerial situation- not to better proportion use types/eliminate opportunities, but to rid the system of burdens associated with poorly functioning trails or lack of USFS/volunteer management capacity

Each of these options has merit in different situations, depending upon managerial capacity, volunteer stewardship partnerships, maximizing occupancy and fee collection at Developed Recreation Areas, collaborative partnerships with communities to better address specific recreation and tourism goals, etc.